

From: Roddy, Elizabeth A CIV USN NAVFAC SW SAN CA (USA)
[elizabeth.rodny@navy.mil]

Sent: Tuesday, April 27, 2021 3:33 PM

To: Praskins, Wayne [Praskins.Wayne@epa.gov]; Juanita.bacey@dtsc.ca.gov; Han,
Terry@CDPH [Terry.Han@cdph.ca.gov]

CC: Stoick, Paul T CIV USN NAVFAC SW SAN CA (USA) [paul.stoick@navy.mil];
Robinson, Derek J CIV USN NAVFAC SW SAN CA (USA) [derek.j.robinson1@navy.mil];
Liscio, Matthew P CIV USN NAVSEA DET RASO VA (USA) [matthew.liscio@navy.mil]

Subject: N62473-17-D-0006 CTO: N6247318F5065 Parcel G - Soil Data Package TU-107

Attachments: CTO5065_RSY38Use1_DataPackageRev2_04192021.pdf;
CTO5065_RSY35Use2_DataPackageRev2_04192021.pdf

Dear Wayne, Nina and Terry,

To support the agencies oversight/split sampling effort and as a curtesy of information sharing, attached you will find the Soil Data Package for Parcel G Phase 1 TU-107.

Please let me know if you have any questions.

Very Respectfully,

Liz Roddy
Remedial Project Manager
NAVFAC BRAC PMO West
33000 Nixie Way
Bldg. 50, Floor 2
San Diego, CA 92147
(619) 524-5755
elizabeth.rodny@navy.mil

Hunters Point Naval Shipyard, Parcel G, RSY Data Report

Contract No. N62473-17-D-006 CTO N6247318F5065 RSY Pad Data Report	
RSY Pad: RSY 35 Use 2	Soil Origin: TU-107B ESU
Data attached and submitted by: Amy Mangel	Data Report Submittal Date: 01/29/2021

Systematic Soil Sample Data: RSY 35 Use 2								
Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 NaI Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁹⁰ Sr Final Analytical Results (pCi/g)	²³² Th Final Analytical Results (pCi/g)
Project Remediation Goals*					1.861	0.141	0.331	1.69
HPPG-ESU-TU107B-001	1	Systematic	10,361	15,359	0.400	0.00122	0.270	0.357
HPPG-ESU-TU107B-002	2	Systematic	9,976	15,359	0.333	0.0710	N/A	N/A
HPPG-ESU-TU107B-003	3	Systematic	10,465	15,359	0.366	0.000	N/A	N/A
HPPG-ESU-TU107B-004	4	Systematic	10,430	15,359	0.432	-0.0209	N/A	N/A
HPPG-ESU-TU107B-005	5	Systematic	10,203	15,359	0.342	0.0304	N/A	N/A
HPPG-ESU-TU107B-006	6	Systematic	10,125	15,359	0.382	-0.0180	N/A	N/A
HPPG-ESU-TU107B-007	7	Systematic	10,420	15,359	0.103	-0.0188	N/A	N/A
HPPG-ESU-TU107B-008	8	Systematic	9,916	15,359	0.394	-0.0490	N/A	N/A
HPPG-ESU-TU107B-009	9	Systematic	10,060	15,359	0.303	-0.0194	N/A	N/A
HPPG-ESU-TU107B-010	10	Systematic	9,931	15,359	0.281	-0.0457	N/A	N/A
HPPG-ESU-TU107B-011	11	Systematic	10,417	15,359	0.473	0.0256	0.0186	0.318
HPPG-ESU-TU107B-012	12	Systematic	10,145	15,359	0.351	-0.0226	N/A	N/A
HPPG-ESU-TU107B-013	13	Systematic	9,957	15,359	0.287	-0.0304	N/A	N/A
HPPG-ESU-TU107B-014	14	Systematic	9,938	15,359	0.353	0.0182	N/A	N/A
HPPG-ESU-TU107B-015	15	Systematic	10,014	15,359	0.172	-0.0351	N/A	N/A
HPPG-ESU-TU107B-016	16	Systematic	9,825	15,359	0.302	-0.00359	N/A	N/A
HPPG-ESU-TU107B-017	17	Systematic	10,057	15,359	0.411	-0.0214	N/A	N/A
HPPG-ESU-TU107B-018	18	Systematic	9,574	15,359	0.362	0.0176	N/A	N/A
HPPG-ESU-TU107B-019	19	Systematic	10,445	15,359	0.358	0.0403	N/A	N/A
HPPG-ESU-TU107B-020	20	Systematic	9,639	15,359	0.341	-0.0132	N/A	N/A
HPPG-ESU-TU107B-021	21	Systematic	10,622	15,359	0.211	0.0103	0.0433	1.25
HPPG-ESU-TU107B-022	22	Systematic	9,997	15,359	0.0537	0.00948	N/A	N/A
HPPG-ESU-TU107B-023	23	Systematic	10,005	15,359	0.293	0.0125	N/A	N/A
HPPG-ESU-TU107B-024	24	Systematic	9,926	15,359	0.307	0.0187	N/A	N/A
HPPG-ESU-TU107B-025	25	Systematic	9,821	15,359	0.355	-0.0149	N/A	N/A
Soil Systematic Sample Statistics					²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁹⁰ Sr Final Analytical Results (pCi/g)	²³² Th Final Analytical Results (pCi/g)
Maximum					0.473	0.071	0.270	1.25
Mean					0.3186	-0.0023	0.1106	0.6417
Median					0.342	-0.0036	0.0433	0.357
Minimum					0.0537	-0.049	0.0186	0.318
Standard Deviation					0.0969	0.0281	N/A	N/A

Biased Soil Sample Data: RSY 35 Use 2								
Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 NaI Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁹⁰ Sr Final Analytical Results (pCi/g)	²³² Th Final Analytical Results (pCi/g)
Project Remediation Goals*					1.861	0.141	0.331	1.69
HPPG-ESU-TU107B-B-001	1	Biased	10,008	15,658	0.329	-0.0251	-0.0106	0.325

CPM Counts per minute

pCi/g Picocuries per gram

* Note: Project Remediation goal (RG) is the Record of Decision RG or Offsite RBA value, whichever is higher

Instrument and Survey Summary					
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #
Gamma Walkover Survey	HPRS-11232020-PG-ROV-334	11/23/2020	RS-700	03/31/2022	5447/5448
Follow-Up Static Survey	HPRS-11242020-PG-JSS-343	11/24/2020	RS-700	03/31/2022	5447/5448
Systematic Sample Survey	HPRS-11242020-PG-JSS-345	11/24/2020	3x3	10/09/2021	271420
Biased Sample Survey	HPRS-11252020-PG-JSS-348	11/25/2020	3x3	08/06/2021	108853

Region of Interest (ROI) Summary	
ROI	Nuclide and Energy
ROI 3	Ra-226 (1764 keV)
ROI 4	Th-232 (2614 keV)
ROI 6	Ra-226 (609 keV)
ROI 7	Cs-137 (662 keV)
ROI 8	Ra-226 (351 keV)
ROI 10	Gross Gamma

Summary: RSY 35 Use 2
<p>1) Gamma walkover survey and data review—upon review of initial RS-700 scan data in accordance with Final Parcel G Work Plan Section 3.5.1.1, 8 follow-up static investigations were required. Gamma scan data summary statistics, normal Q-Q plots, histograms, and box plots are provided on pages 3-6. Contour maps of the scan data for the ROIs of interest are presented on page 7. The RSY scan data was lower than the background scan data. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection. Note: this RSY pad was only partially full, which is why there is a low number of scan data points.</p>
<p>2) One-minute static follow-up measurements with the RS-700 were collected at 8 gamma walkover investigation locations in accordance with Final Parcel G Work Plan Section 3.3.1. A map of the follow-up locations is presented on page 9. The net follow-up static spectra are presented on pages 14-21. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection.</p>
<p>3) In accordance with Final Parcel G Work Plan Section 3.4.1, twenty-five systematic soil samples (001-025) were obtained and submitted for gamma spectroscopy analysis. Sample locations are shown on the Systematic Sample Survey map (page 10). TestAmerica sample results are attached (pages 22-55). Ten percent of the systematic soil samples (three samples in total -001, -011, & -021) were also analyzed for ⁹⁰Sr and ²³²Th (via alpha spectroscopy). Strontium-90 and ²³²Th results are also included in the TestAmerica sample results reports (pages 22-55). Samples HPPG-F-049 and HPPG-F-050 are field duplicates, correlating to systematic samples -004 and -016. The Data Quality Assessment which will be included in the RACR will provide an analysis and discussion of field duplicates for the project. The Instrument and Survey Summary table above lists the 3x3 NaI detector used for the gamma static measurements collected during sampling activities, and the instrument-specific gamma static IL listed in the sample tables on page one is developed from that instrument's RBA data.</p> <p>Systematic sample histograms, box plots, Q-Q plots, and power curves are provided on pages 12-13. All sample results were below the applicable RGs. The number of samples collected was sufficient to meet project DQOs.</p>
<p>4) In accordance with Final Parcel G Work Plan Section 3.3.1 and 3.4.1, one biased sample was collected since all follow-up static measurements were below the ROC-specific critical levels. The biased sample was collected from the location of the highest gross gamma scan measurement. TestAmerica sample results are attached (pages 56-72). A map of the biased sample location is presented on page 11. Biased sample results were all below the applicable RGs.</p>
<p>Conclusions:</p> <p>In accordance with the DQOs in Section 3.1 of the Final Parcel G Work Plan, final analytical results for all samples from the RSY pad were shown by a point by point comparison to meet the RGs. Graphical comparisons demonstrated that ROC concentrations were consistent with background.</p> <p>RSY 35 Use 2 contains soil from Hunters Point Naval Shipyard Parcel G Phase 1 excavation TU-107B ESU.</p> <p>APTIM requests RASO concurrence to release this soil as Non-LLRW.</p> <p>Disposition: This soil shall be used as backfill for TU-107.</p>

Soil Scan Statistics

Statistical Summary

Dataset	PG-RSY-35-U2				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	4.01	25.06	13.20	13.03	3.59
ROI-04	3.01	24.05	13.51	13.03	3.64
ROI-06	65.13	126.26	91.00	91.18	10.05
ROI-07	45.10	98.21	70.70	71.14	8.72
ROI-08	77.17	160.33	113.56	113.27	11.08
ROI-10	2,024.29	2,471.99	2,245.02	2,249.27	71.57

Statistical Summary Reference Background

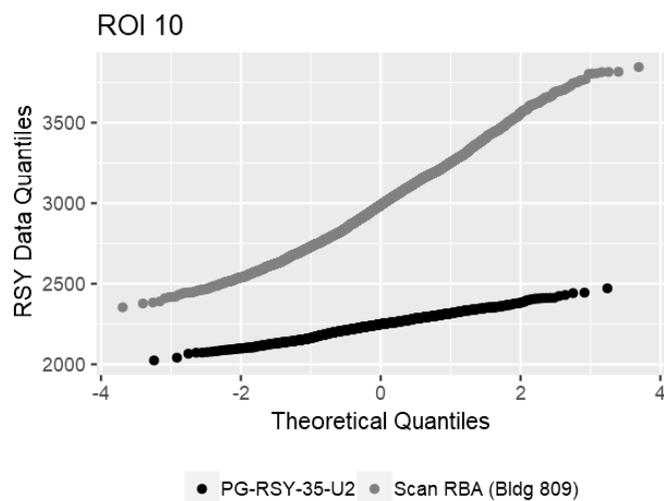
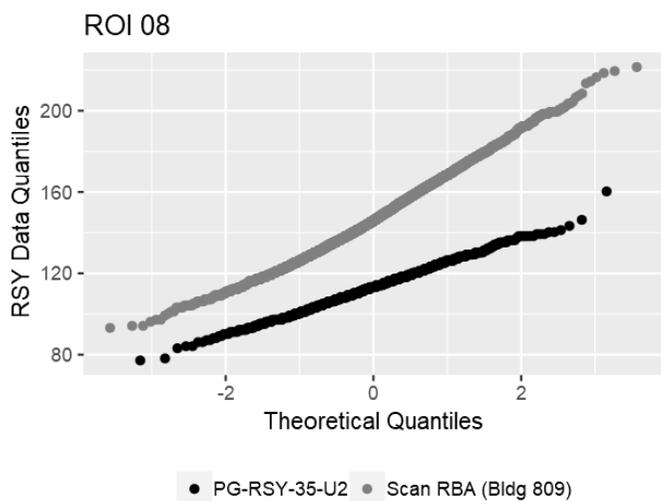
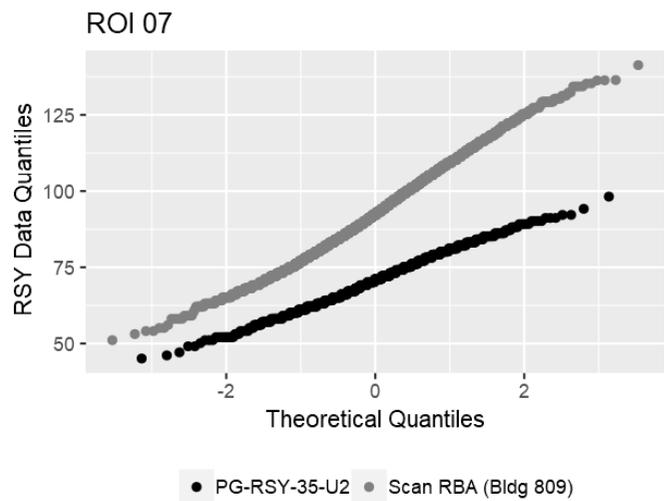
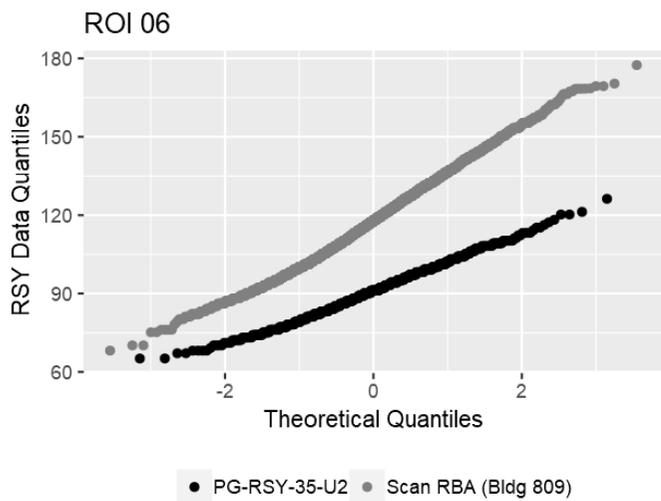
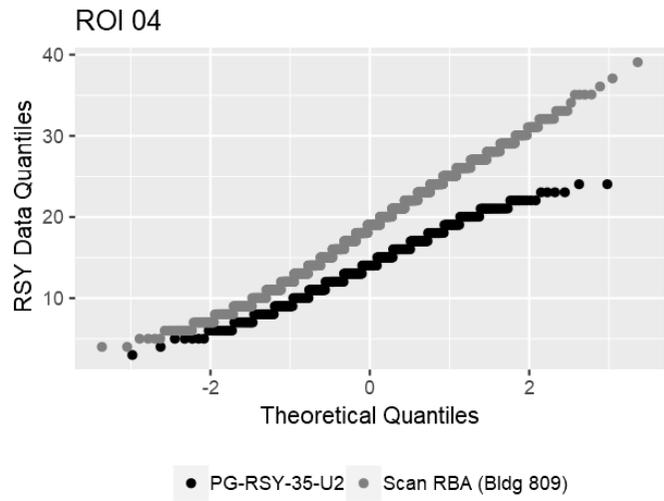
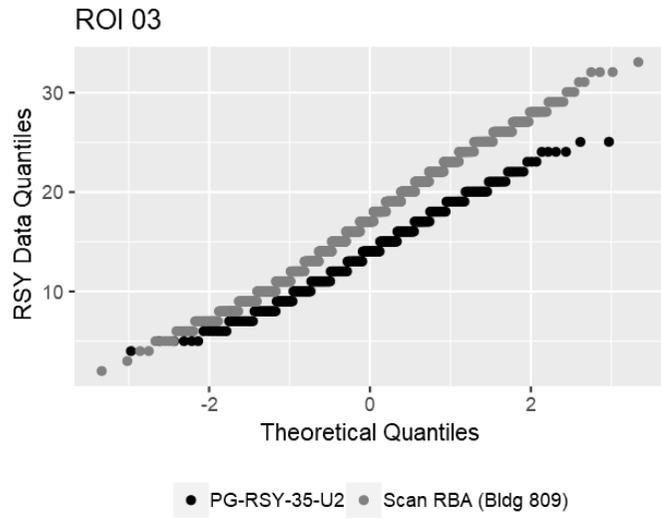
TYPE	Scan RBA (Bldg 809)				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	2.00	33.08	16.21	16.04	4.13
ROI-04	4.01	39.08	17.52	17.04	4.89
ROI-06	68.15	177.45	117.58	117.26	15.50
ROI-07	51.11	141.33	92.34	91.24	13.43
ROI-08	93.19	221.48	146.24	145.30	18.21
ROI-10	2,354.11	3,845.31	2,995.57	2,989.64	255.66

cps = counts per second

Dataset	Number of Data Points
PG-RSY-35-U2	869
Scan RBA (Bldg 809)	4632

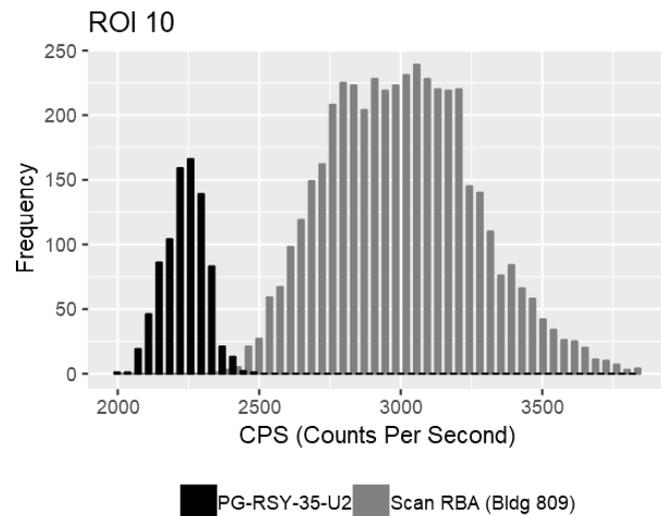
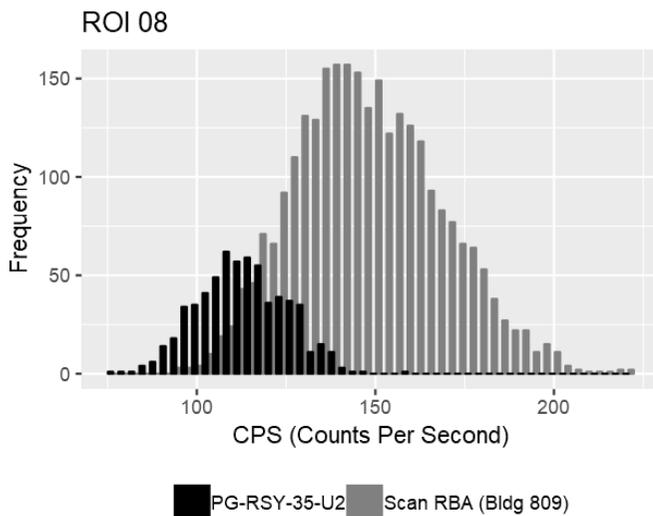
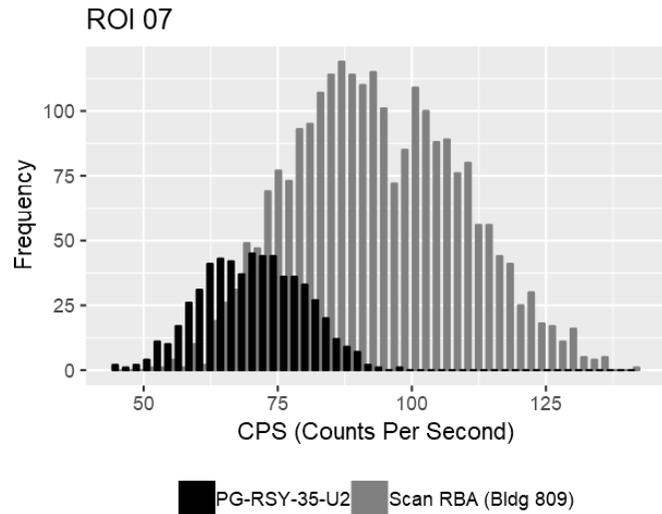
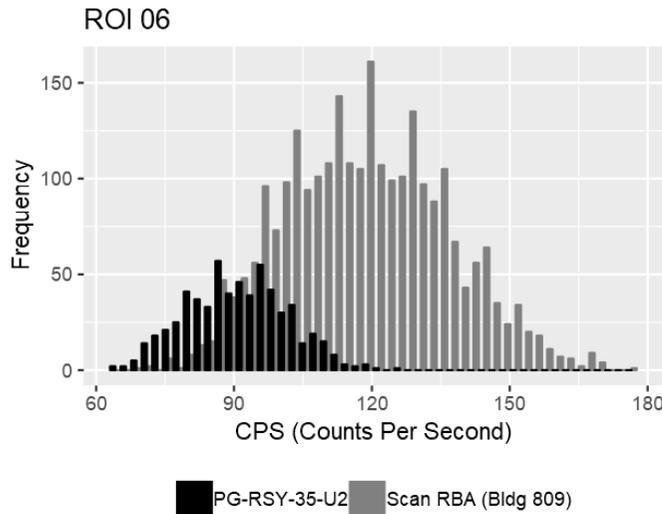
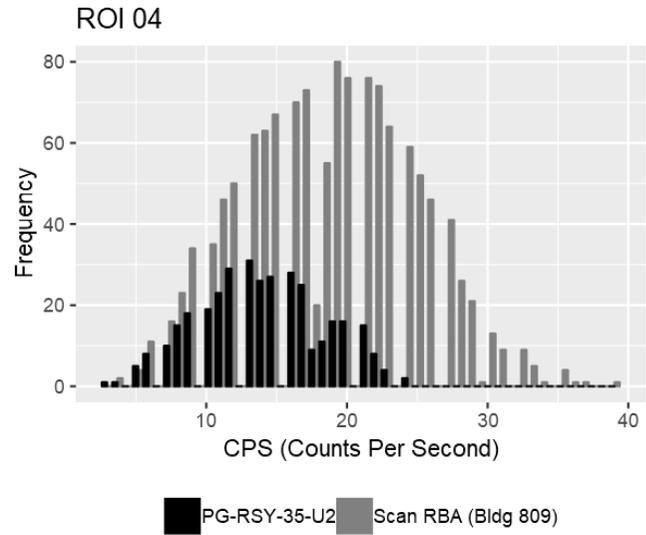
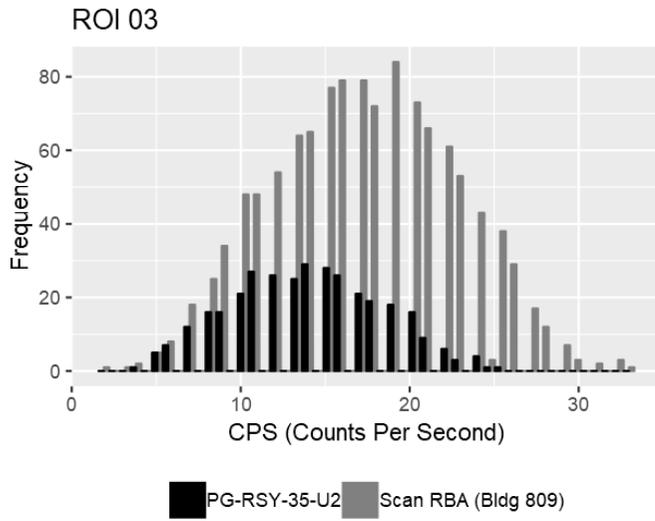
Soil Scan Statistics

Normal Q-Q Plots



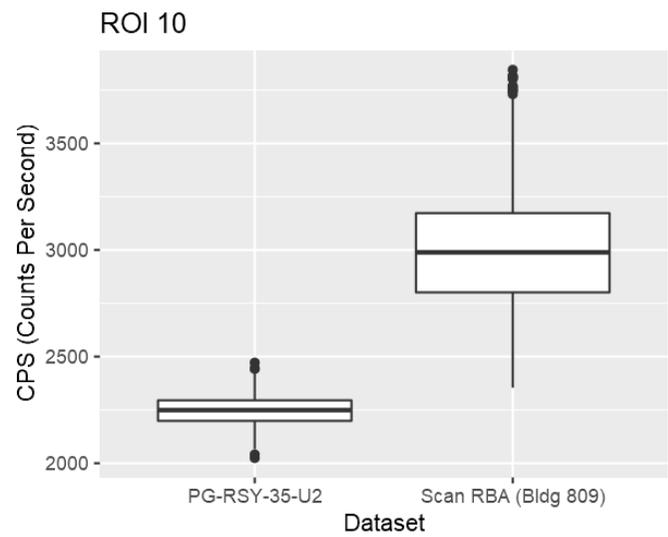
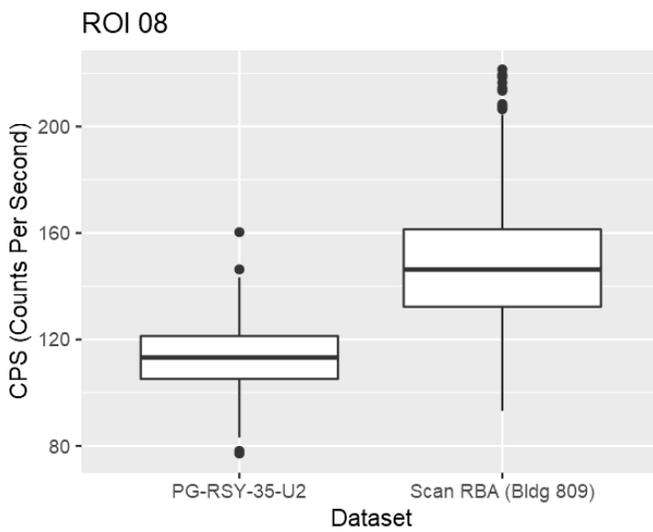
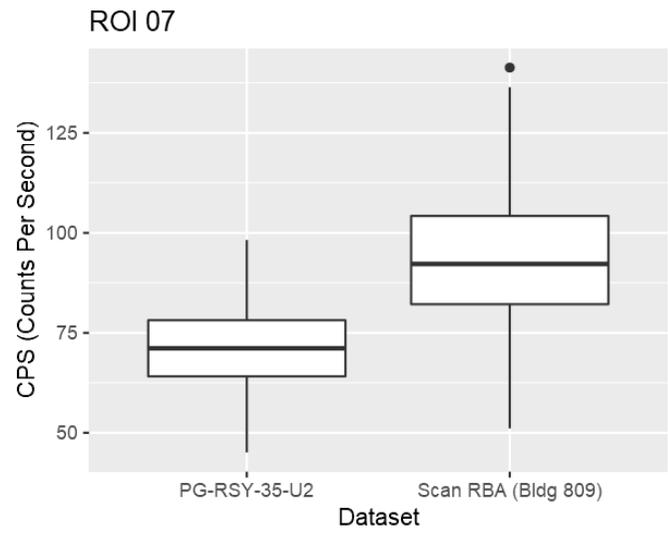
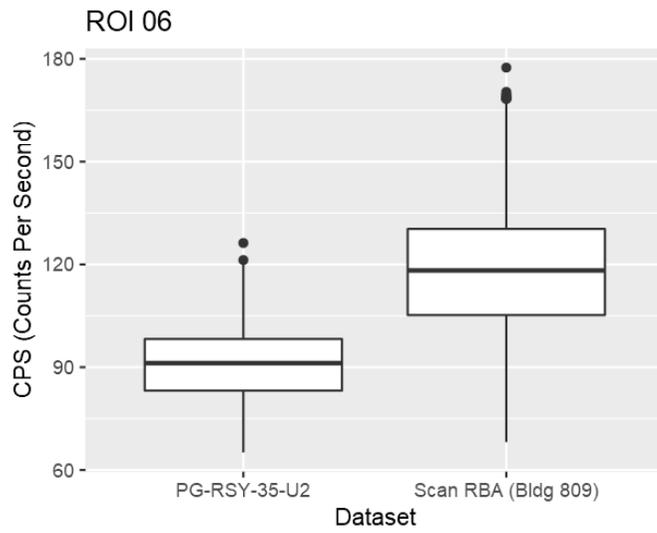
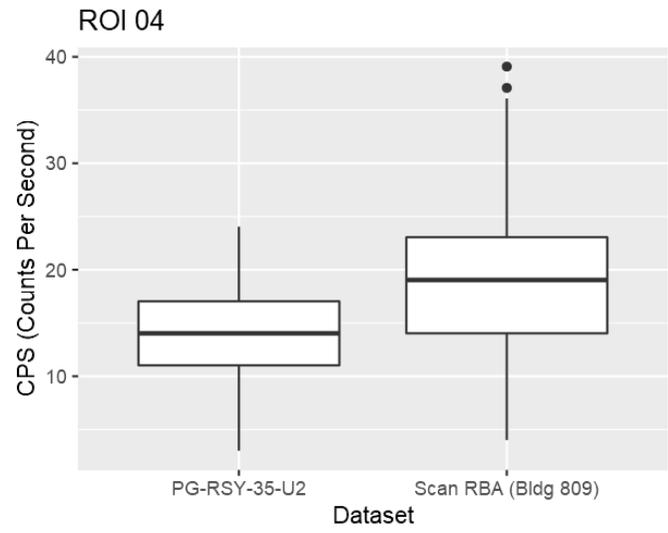
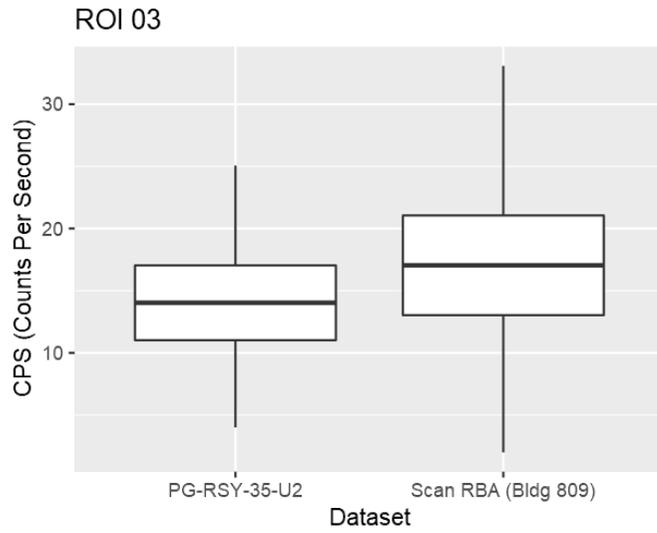
Soil Scan Statistics

Histograms



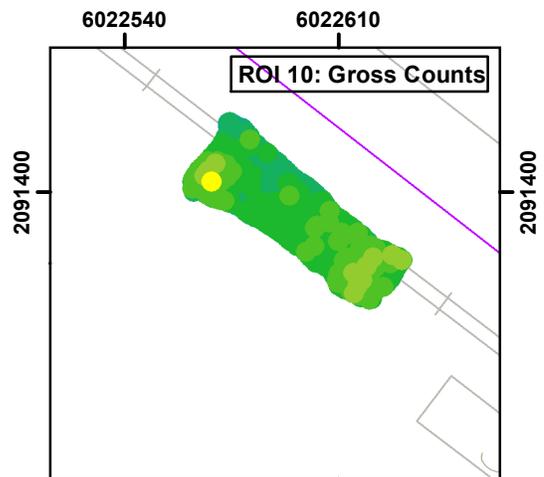
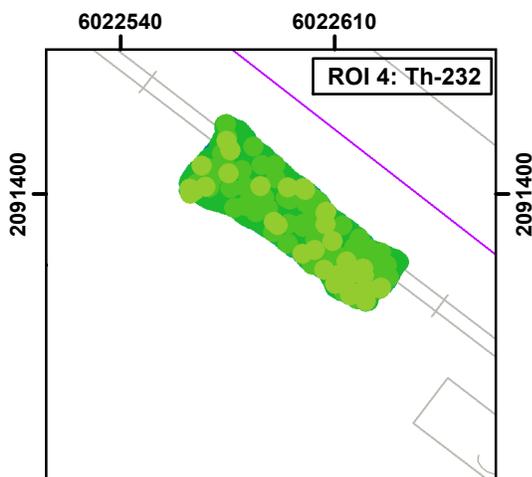
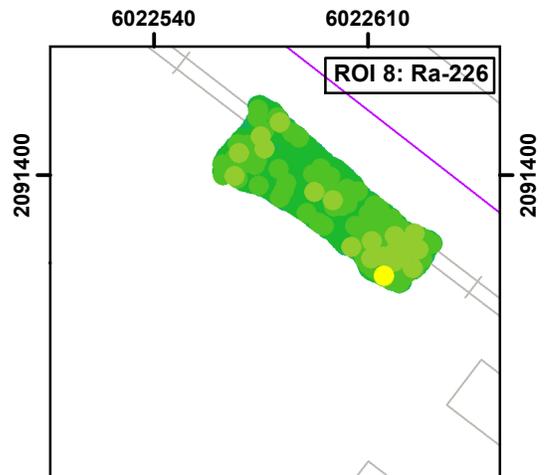
Soil Scan Statistics

Box Plots



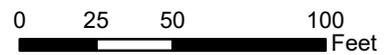
RSI Data Plots
HPNS Parcel G
RSY 35 Use 2

TU-107B ESU



RS 700 Gamma Walkover Survey Data (VD1)

- | | |
|----------------------|------------------------|
| ● > 3 std dev | ● > -1 to < 0 std dev |
| ● > 2 to < 3 std dev | ● > -2 to < -1 std dev |
| ● > 1 to < 2 std dev | ● > -3 to < -2 std dev |
| ● > 0 to < 1 std dev | ● < -3 std dev |

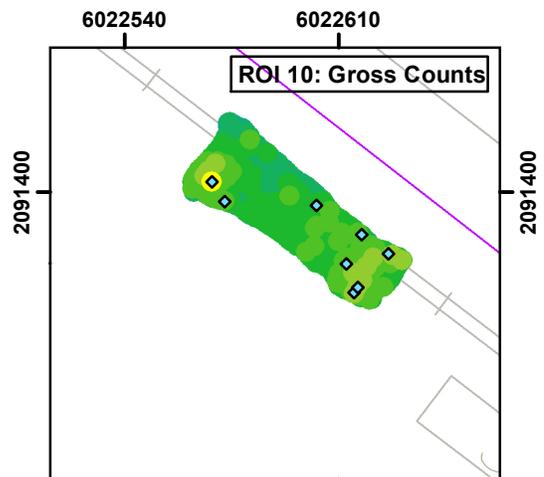
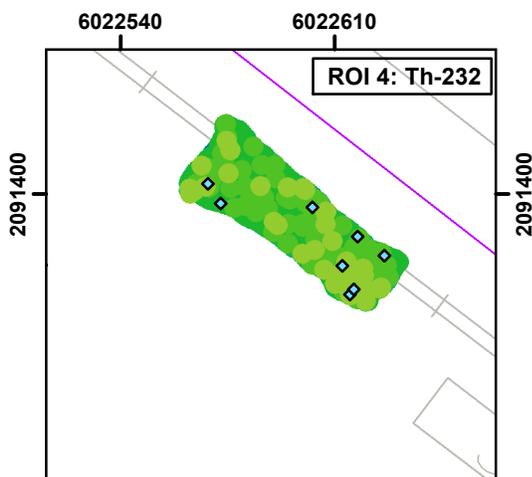
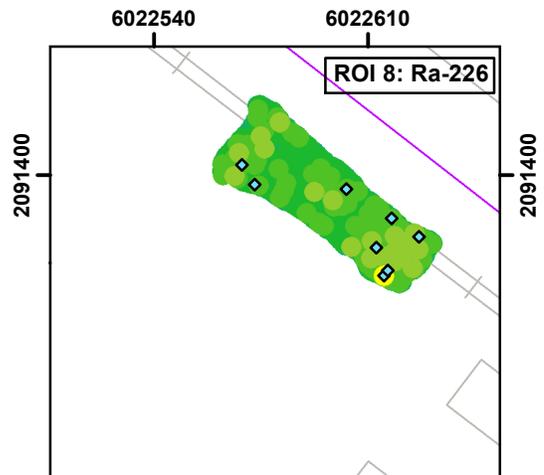
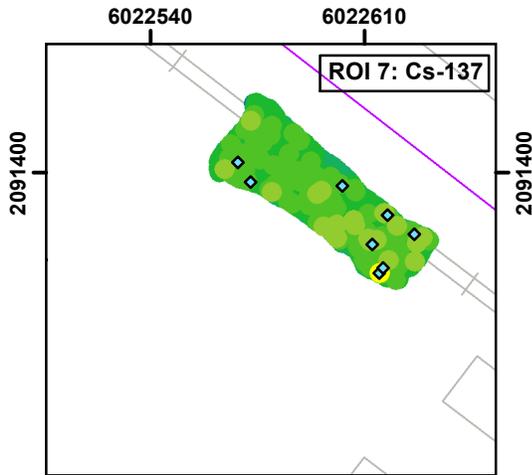
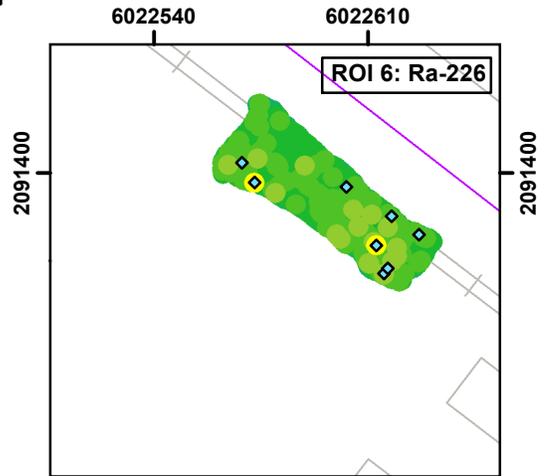
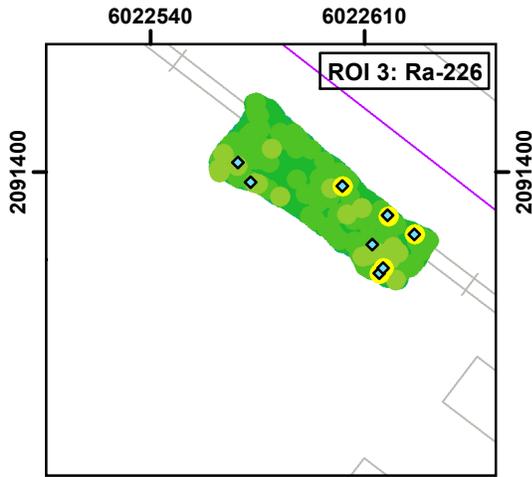


Coordinate system: CSP Zone III, NAD83, US Survey Foot



RSI Data Plots
HPNS Parcel G
RSY 35 Use 2

TU-107B ESU



RS 700 Gamma Walkover Survey Data (VD1)

◆ Follow-Up Locations	● > -1 to < 0 std dev
● > 3 std dev	● > -2 to < -1 std dev
● > 2 to < 3 std dev	● > -3 to < -2 std dev
● > 1 to < 2 std dev	● < -3 std dev
● > 0 to < 1 std dev	

0 25 50 100 Feet

Coordinate system: CSP Zone III, NAD83, US Survey Foot

RSI Data Plots
HPNS Parcel G
RSY 35 Use 2

TU-107B ESU



RSY 35 Use 2 (VD1, ROI 10 Gross Gamma)

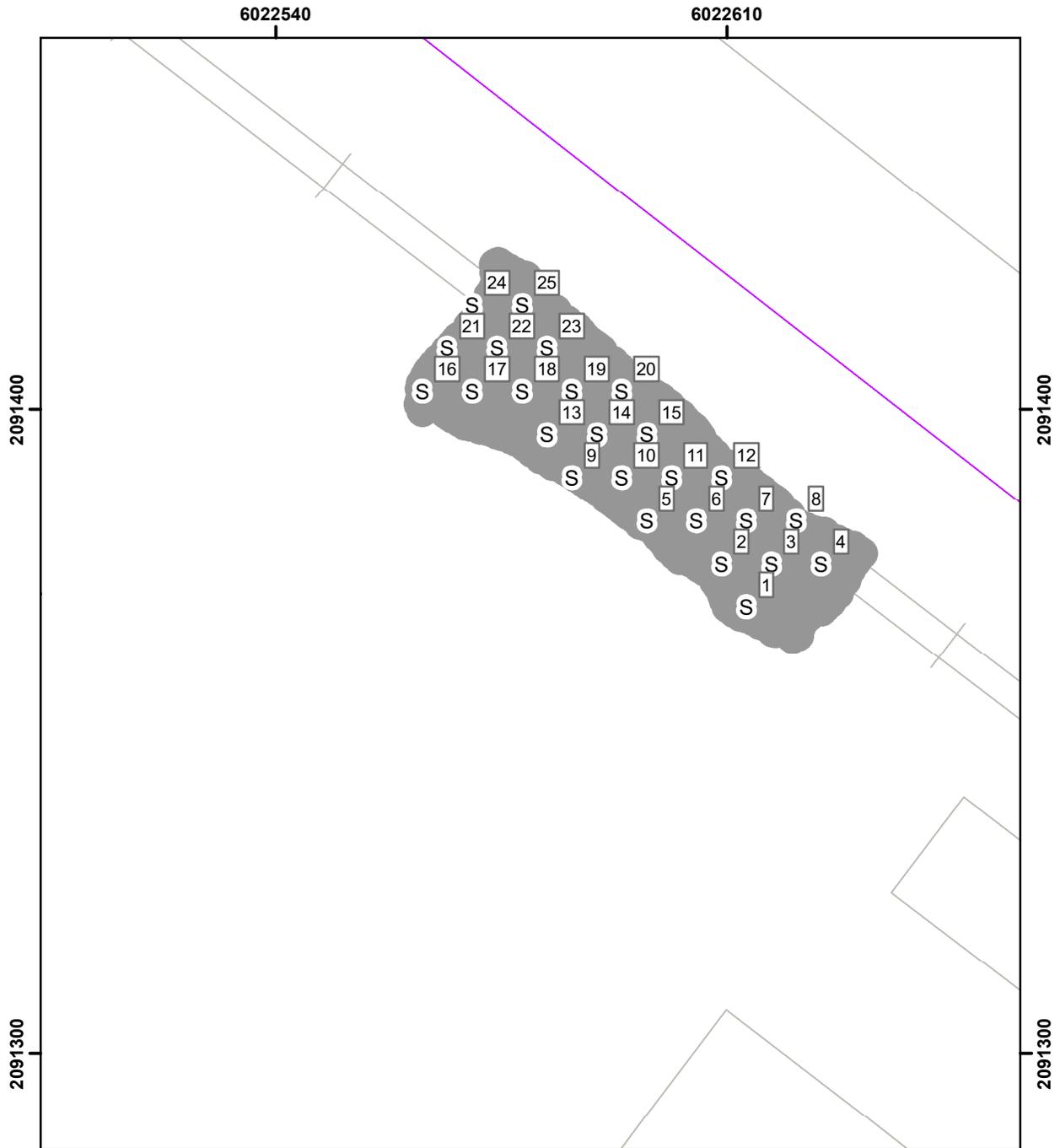
◆ Follow-Up Locations	● > 1 to < 2 std dev	● > -2 to < -1 std dev
● > 3 std dev	● > 0 to < 1 std dev	● > -3 to < -2 std dev
● > 2 to < 3 std dev	● > -1 to < 0 std dev	● < -3 std dev

20 10 0 20 Feet

Coordinate system: CSP Zone III, NAD83, US Survey Foot

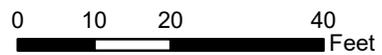
**Systematic Sampling
HPNS Parcel G
RSY 35 Use 2**

TU-107B ESU



RSY 35 Use 2

- S Systematic Sample Locations
- RS-700 GWS Coverage

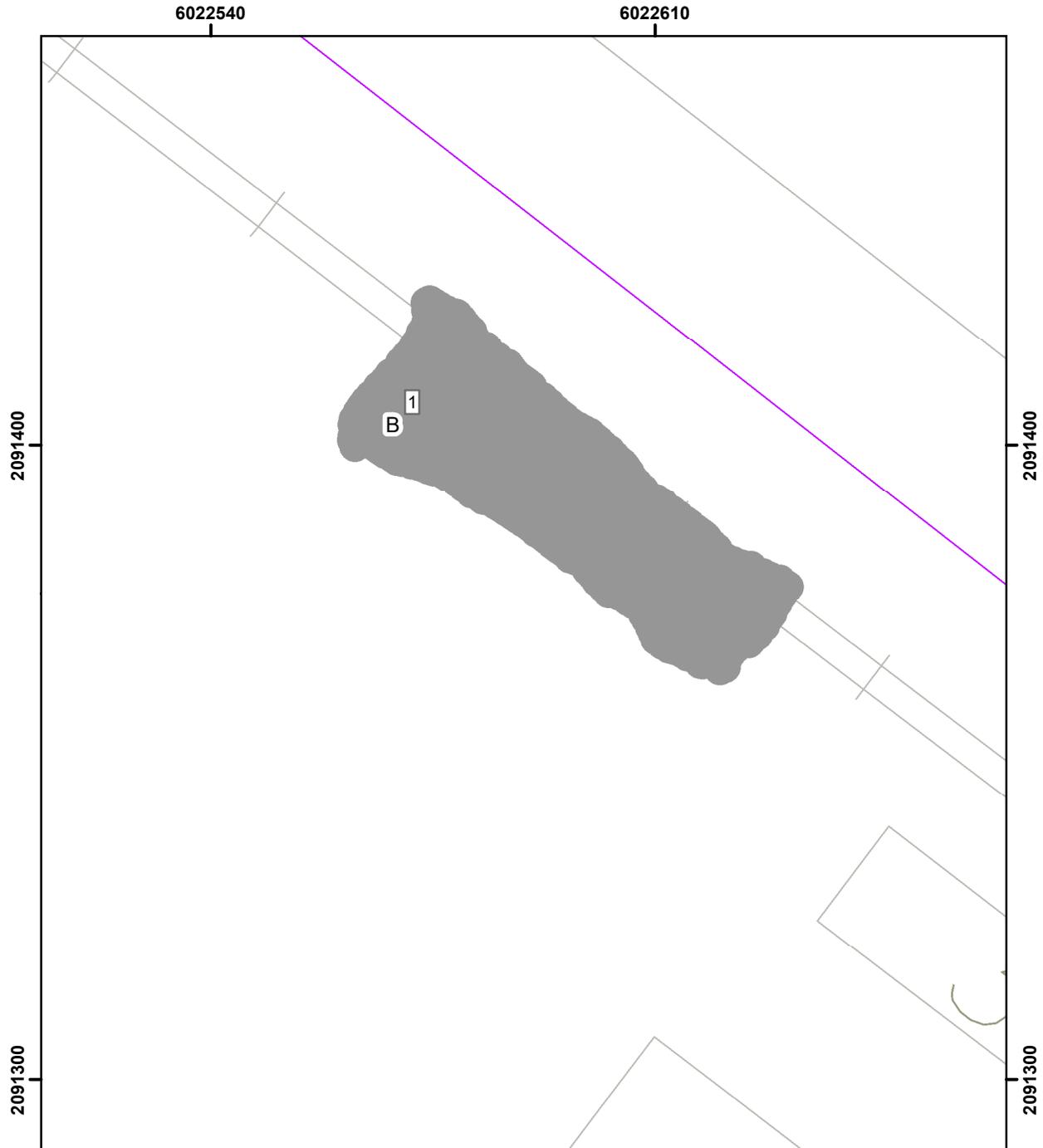


Coordinate system: CSP Zone III, NAD83, US Survey Foot



Biased Sampling
HPNS Parcel G
RSY 35 Use 2

TU-107B ESU



RSY 35 Use 2

- B** Biased Sample Location
-  RS-700 GWS Coverage

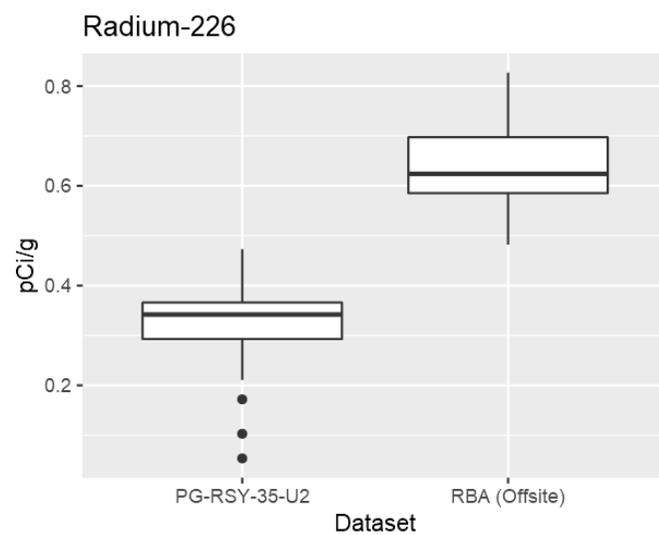
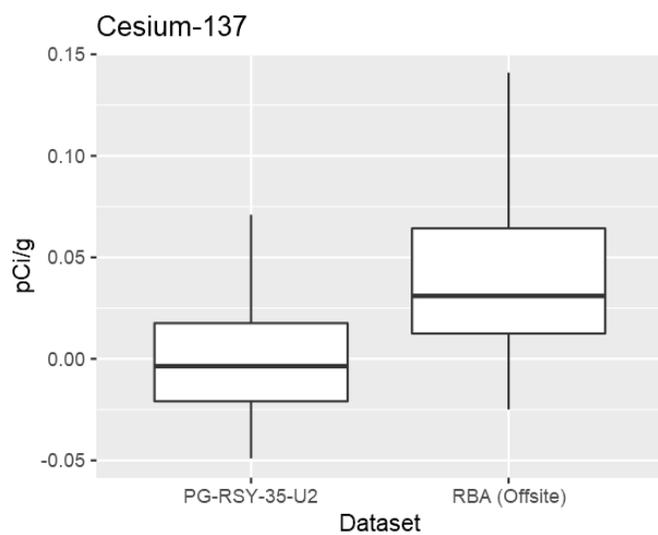
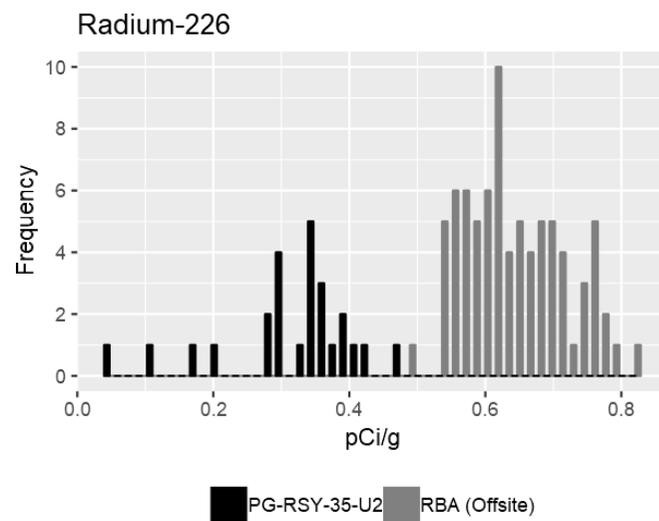
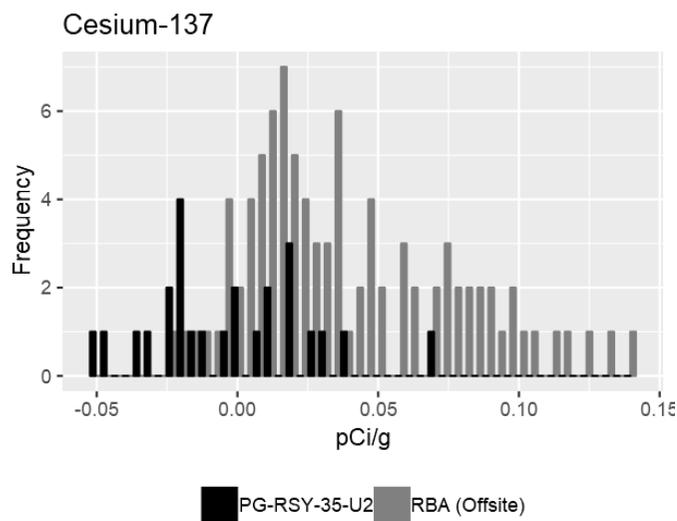
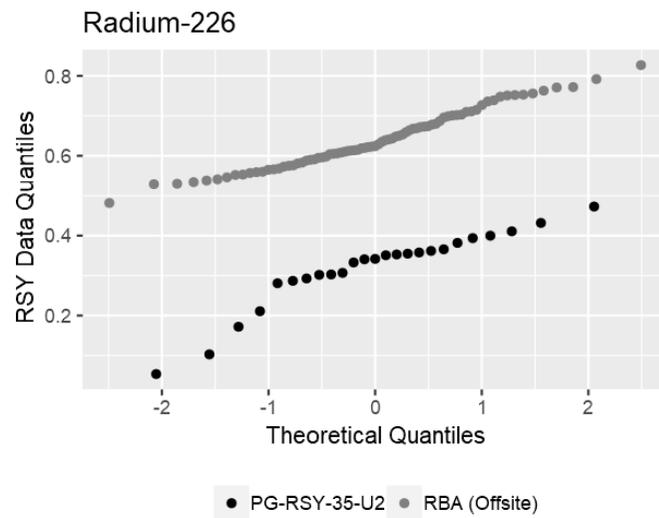
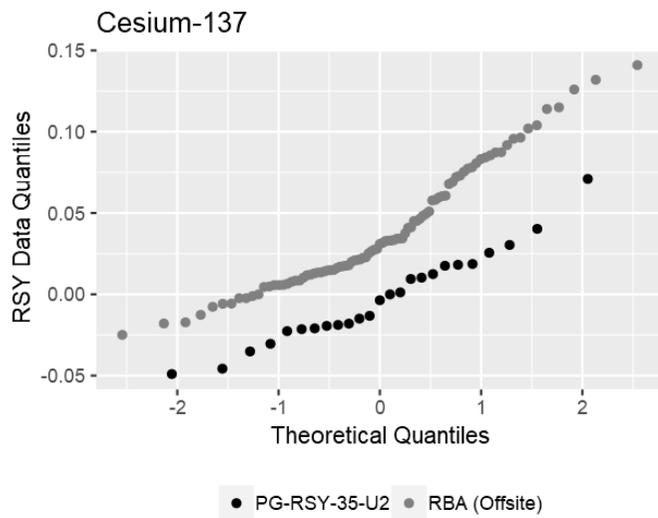
20 10 0 20 Feet



Coordinate system: CSP Zone III, NAD83, US Survey Foot



Soil Sample Statistics



WILCOXON RANK SUM TEST

Nuclide: **Ra-226**
 LGR: **0.342 pCi/g**

Location: **RSY 35 Use 2**

DOGL: **1**
 LBGR = **0.342**
 LBGR = **0.342**

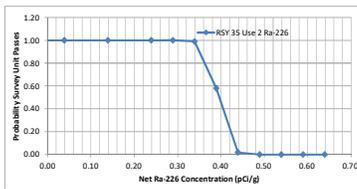
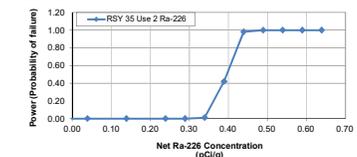
POWER CURVE CALCULATION

DATA	AREA	ADJUSTED DATA	RANKS	SURVEY UNIT	Sorted Ranks	Location Associated with Sorted Rank
0.59	R	0.588	48.5	0	1	S
0.69	R	0.687	101	0	2	S
0.57	R	0.566	40	0	3	S
0.64	R	0.635	78.5	0	4	S
0.61	R	0.606	58	0	5	S
0.65	R	0.653	87.5	0	6	S
0.61	R	0.613	62	0	7	S
0.71	R	0.711	109	0	8	S
0.68	R	0.68	99.5	0	9	S
0.61	R	0.608	59	0	10	S
0.54	R	0.541	31	0	11	S
0.59	R	0.588	48.5	0	12	S
0.67	R	0.673	96	0	13	S
0.67	R	0.674	97	0	14	S
0.48	R	0.482	26	0	15	S
0.76	R	0.763	121	0	16	S
0.75	R	0.748	115	0	17	S
0.56	R	0.56	37.5	0	18	S
0.61	R	0.614	64	0	19	S
0.53	R	0.529	27	0	20	S
0.61	R	0.605	57	0	21	S
0.58	R	0.575	44	0	22	S
0.67	R	0.672	95	0	23	S
0.56	R	0.559	38	0	24	S
0.68	R	0.664	90.5	0	25	S
0.55	R	0.546	32	0	26	R
0.74	R	0.739	114	0	27	R
0.74	R	0.736	113	0	28	R
0.60	R	0.604	56	0	29	R
0.70	R	0.701	105	0	30	R
0.59	R	0.589	104	0	31	R
0.70	R	0.699	104	0	32	R
0.62	R	0.624	73.5	0	33	R
0.58	R	0.583	43	0	34	R
0.57	R	0.573	43	0	35	R
0.62	R	0.623	71	0	36	R
0.60	R	0.598	58	0	37.5	R
0.64	R	0.643	84	0	37.5	R
0.55	R	0.553	34	0	39	R
0.75	R	0.751	116.5	0	40	R
0.77	R	0.771	122	0	41.5	R
0.72	R	0.715	110.5	0	41.5	R
0.62	R	0.62	68	0	43	R
0.71	R	0.71	108	0	44	R
0.58	R	0.581	46	0	45	R
0.60	R	0.595	53	0	46	R
0.58	R	0.58	37.5	0	47	R
0.75	R	0.751	116.5	0	48.5	R
0.67	R	0.669	93.5	0	48.5	R
0.62	R	0.619	67.5	0	49.5	R
0.64	R	0.641	82.5	0	50.5	R
0.59	R	0.589	104	0	52	R
0.61	R	0.614	64	0	53	R
0.65	R	0.653	87.5	0	54	R
0.58	R	0.576	45	0	55	R
0.62	R	0.622	69.5	0	56	R
0.57	R	0.565	39	0	57	R
0.63	R	0.629	76.5	0	58	R
0.64	R	0.641	82.5	0	59	R
0.61	R	0.614	64	0	60	R
0.66	R	0.664	90.5	0	61	R
0.77	R	0.772	123	0	62	R
0.64	R	0.639	80.5	0	64	R
0.62	R	0.624	73.5	0	64	R
0.61	R	0.612	61	0	64	R
0.65	R	0.648	85	0	66	R
0.55	R	0.552	33	0	67	R
0.62	R	0.624	73.5	0	68	R
0.62	R	0.616	69.5	0	69.5	R
0.64	R	0.635	78.5	0	69.5	R
0.70	R	0.703	107	0	71	R
0.53	R	0.53	28.5	0	73.5	R
0.73	R	0.727	112	0	73.5	R
0.62	R	0.624	73.5	0	73.5	R
0.65	R	0.65	80.5	0	75	R
0.67	R	0.668	92	0	76.5	R
0.54	R	0.538	30	0	76.5	R
0.57	R	0.568	41.5	0	76.5	R
0.60	R	0.596	54	0	76.5	R
0.59	R	0.591	52	0	80.5	R
0.68	R	0.678	98	0	80.5	R
0.67	R	0.669	93.5	0	82.5	R
0.79	R	0.792	124	0	82.5	R
0.75	R	0.752	118	0	84	R
0.56	R	0.557	35	0	85	R
0.62	R	0.622	69.5	0	86	R
0.70	R	0.702	106	0	87.5	R
0.64	R	0.639	80.5	0	87.5	R
0.76	R	0.756	120	0	89	R
0.70	R	0.696	102.5	0	90.5	R
0.72	R	0.715	110.5	0	90.5	R
0.66	R	0.659	89	0	92	R
0.70	R	0.696	102.5	0	93.5	R
0.63	R	0.629	76.5	0	93.5	R
0.68	R	0.68	99.5	0	95	R
0.53	R	0.534	29	0	96	R
0.61	R	0.61	60	0	97	R
0.83	R	0.827	125	0	98	R
0.75	R	0.753	119	0	99.5	R
0.57	R	0.568	41.5	0	99.5	R
0.4	S	0.058	22	22	101	R
0.333	S	-0.009	11	11	102.5	R
0.368	S	0.024	19	19	102.5	R
0.432	S	0.09	24	24	104	R
0.342	S	0	13	13	105	R
0.382	S	0.04	20	20	106	R
0.103	S	-0.239	2	2	107	R
0.384	S	0.052	21	21	108	R
0.303	S	-0.039	9	9	109	R
0.281	S	-0.061	5	5	110.5	R
0.473	S	0.131	25	25	110.5	R
0.381	S	0.009	14	14	112	R
0.287	S	-0.055	6	6	113	R
0.353	S	0.011	15	15	114	R
0.172	S	-0.17	3	3	115	R
0.302	S	-0.04	8	8	116.5	R
0.411	S	0.069	23	23	116.5	R
0.382	S	0.02	16	16	118	R
0.388	S	0.016	17	17	119	R
0.341	S	-0.001	12	12	120	R
0.211	S	-0.151	4	4	121	R
0.6537	S	-0.2883	1	1	122	R
0.293	S	-0.049	7	7	123	R
0.387	S	-0.035	10	10	124	R
0.355	S	0.013	16	16	125	R
Sum =			7876	325		

Count	SU Stats	m
25	0.097	
1	0.342	
100	0.073	n
1951.9		Critical Value

LBGR	Pr	N	Actual N	SU σ	Z1 (1-alpha)	Z1 (1-beta)
0.342	6.79	25.23	13	0.097	2.326	1.645

Concentration (C)	SD	p1	p2	E(Wmw)	Var(Wmw)	SD(Wmw)	z	Power	Probability of passing	
0.8	-0.06	-4.2	0.00234	0.00017	5.8475	57.69651	7.593189	213.416	0.00	1.00
0.9	0.04	-3.1	0.01695	0.00269	42.3675	780.5102	27.93761	56.8973	0.00	1.00
1	0.14	-2.1	0.07865	0.02307	196.625	5371.815	73.29267	19.5071	0.00	1.00
1.1	0.24	-1.1	0.21834	0.09889	545.845	16176.98	127.1887	8.49533	0.00	1.00
1.15	0.29	-0.5	0.36184	0.20627	994.593	23744.32	154.0919	4.69397	0.00	1.00
1.2	0.34	0.0	0.50000	0.33333	1250	25249.9	162.0182	2.32292	0.01	0.99
1.25	0.39	0.5	0.63816	0.48259	1595.41	23744.63	154.0929	0.20084	0.42	0.58
1.3	0.44	1.0	0.78625	0.63370	1960.63	17599.17	132.6279	-2.066	0.98	0.02
1.35	0.49	1.5	0.93558	0.78581	2338.95	10701.88	103.4469	-4.955	1.00	0.00
1.4	0.54	2.0	0.92135	0.86577	2303.38	5372.123	73.29476	-9.2369	1.00	0.00
1.45	0.59	2.5	0.96145	0.93137	2403.63	2238.671	47.31459	-16.428	1.00	0.00
1.5	0.64	3.1	0.98581	0.97573	2464.53	819.7334	24.88445	-33.669	1.00	0.00



QUANTILE TEST

From NUREG 1505, Table A.7b Values of α and k for the Quantile Test When α is Approximately 0.025

Use:	m	n	f	k	alpha
25	100	25	4	3	0.025

If k or more of the r largest measurements in the combined ranked data set are from the survey unit, the null hypothesis of the Quantile test (that there is no residual radioactivity above the LBGR in any part of the survey unit) is rejected.

0 of the largest 4 adjusted measurements are from S. The null hypothesis is accepted.

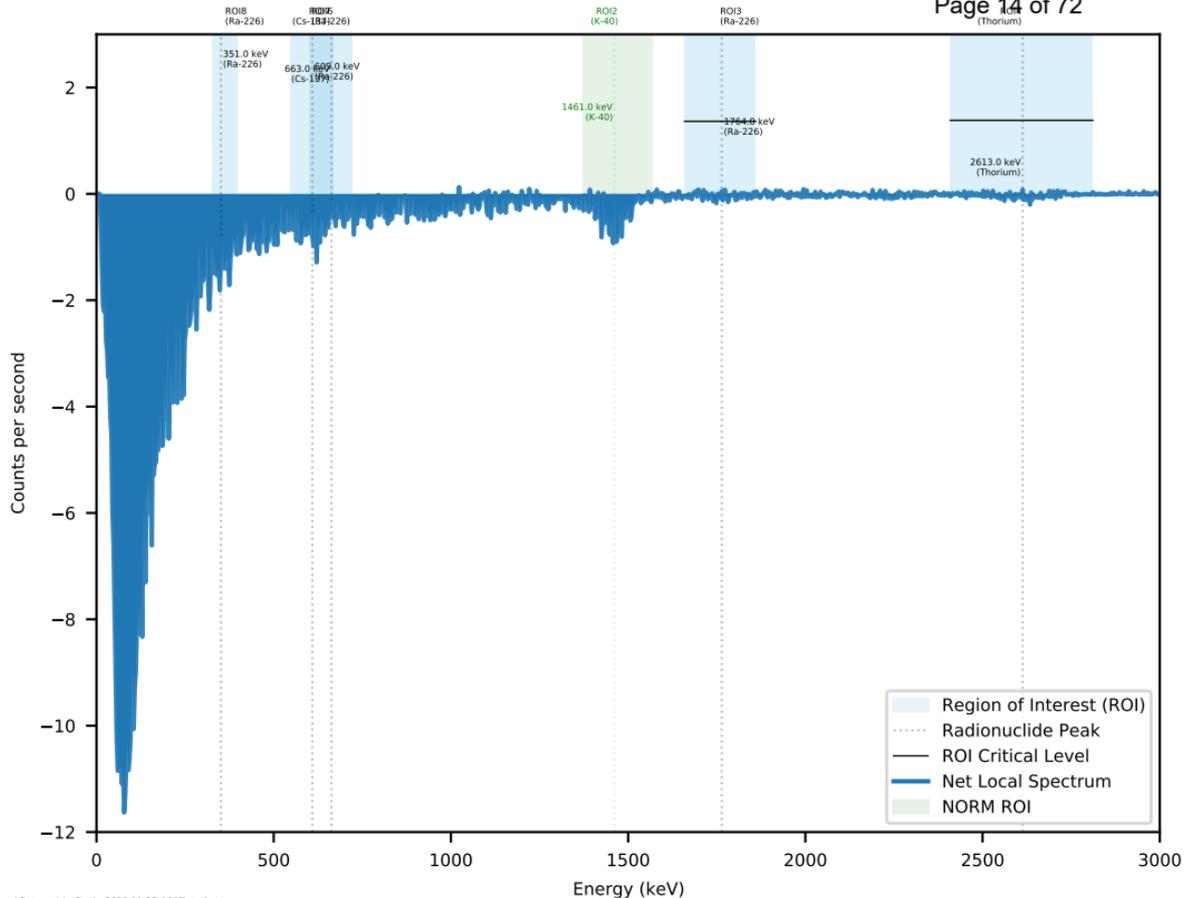
# of R:	# of S:	n	m
100	25	100	25
75.5	13	75.5	13

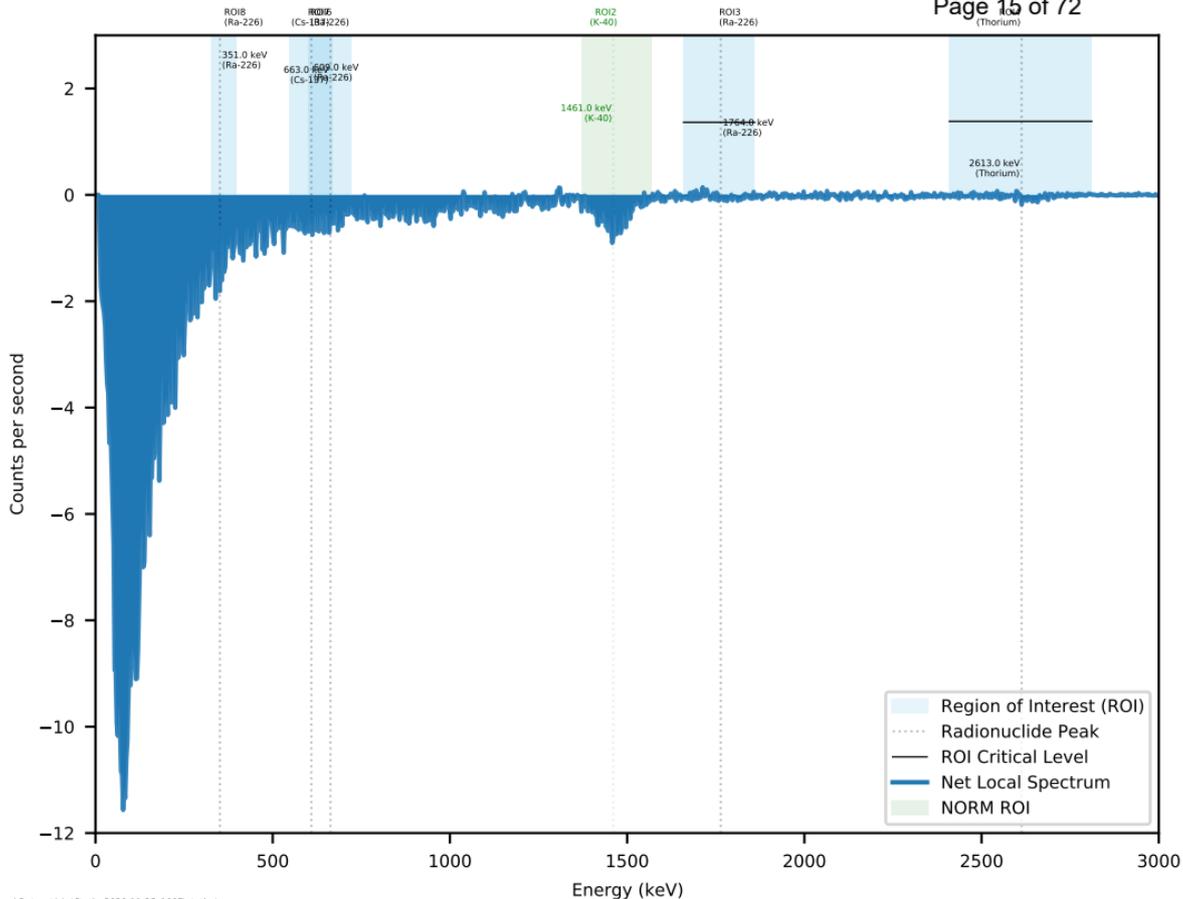
For m or n greater than 20, the critical value (k) can be calculated from

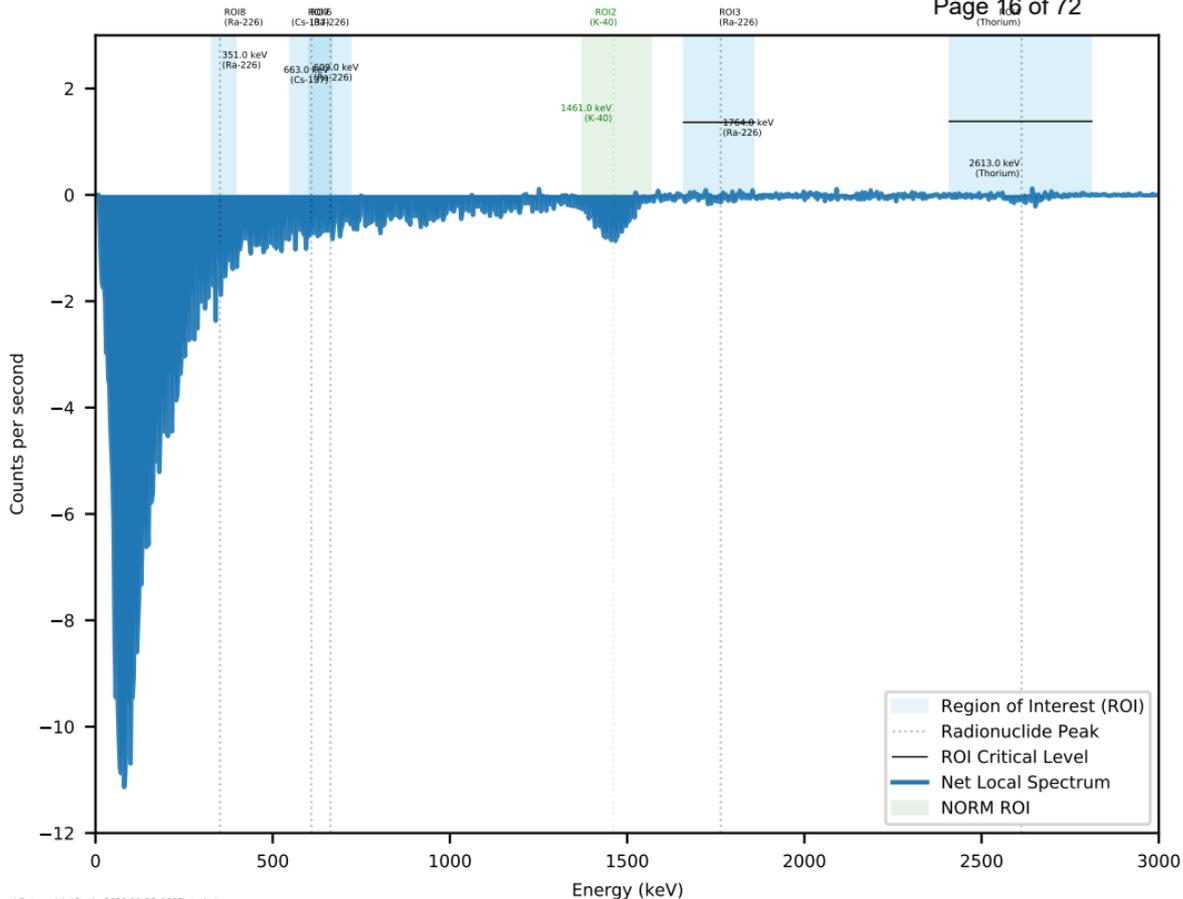
$$\frac{m(n+m+1)}{2} + z \sqrt{\frac{nm(n+m+1)}{12}}$$

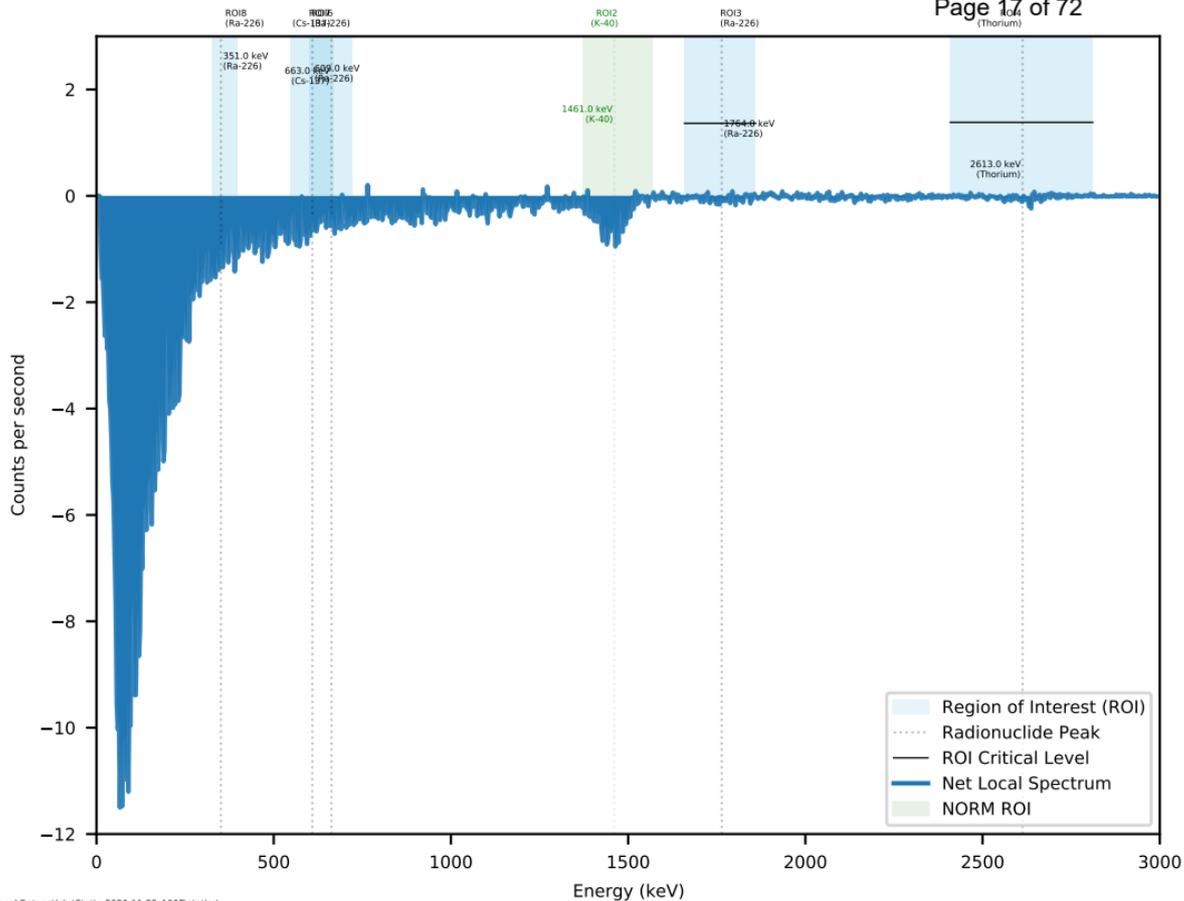
$z = 99.0\%$ percentile of standard normal distribution = 2
 $k = 1951.9$

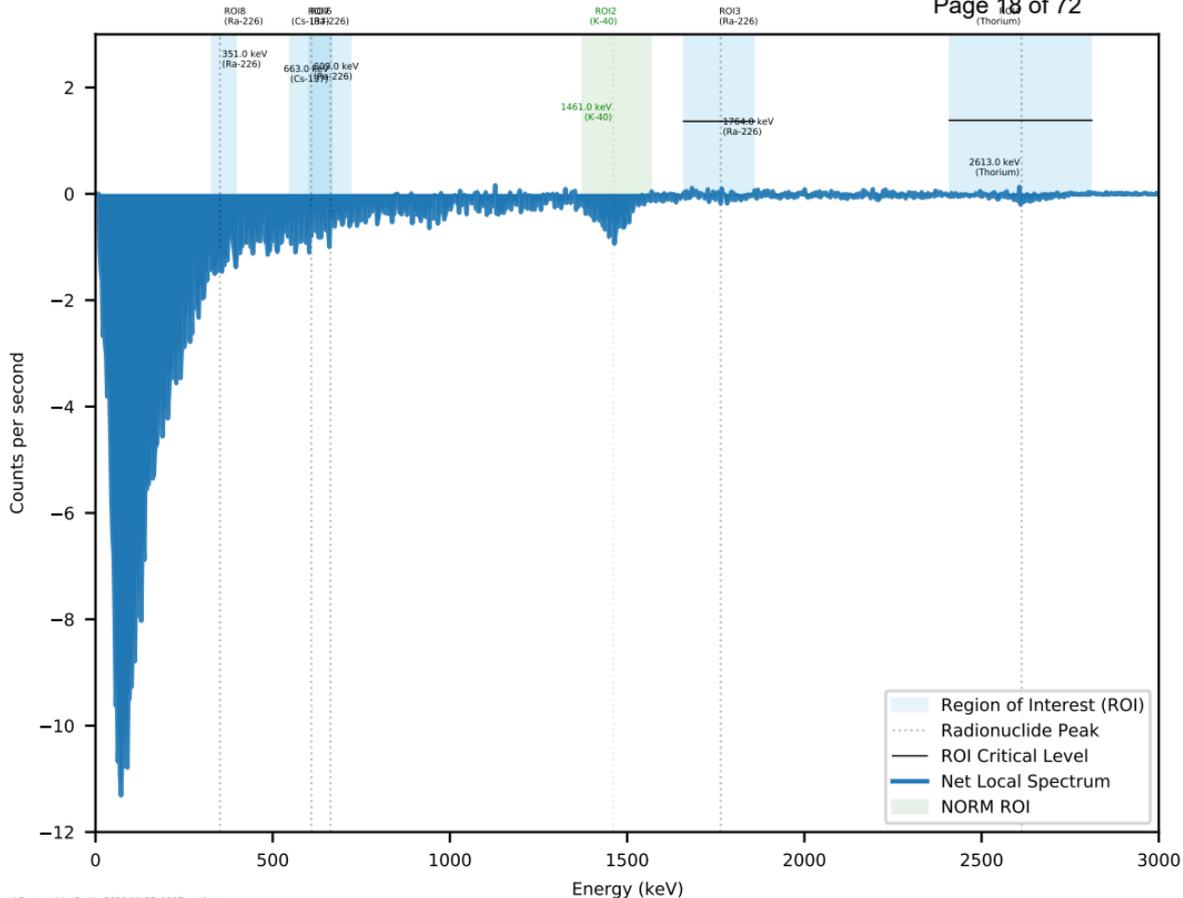
Since the sum of survey unit ranks is less than the critical value, the null hypothesis that the survey unit concentrations do not exceed the LBGR is accepted (i.e., survey unit passes).
 $\alpha = 0.02 = 0.01$
 $\beta = 0.05$

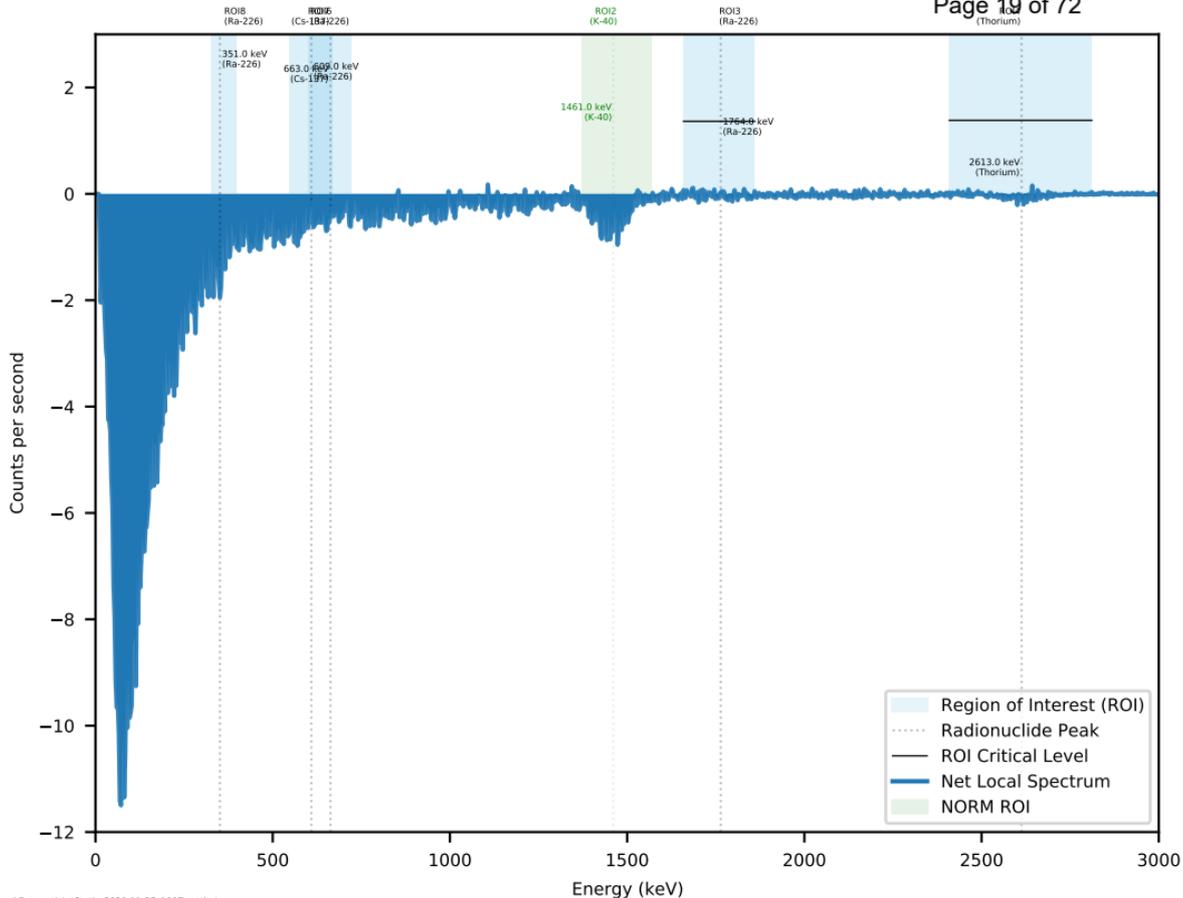


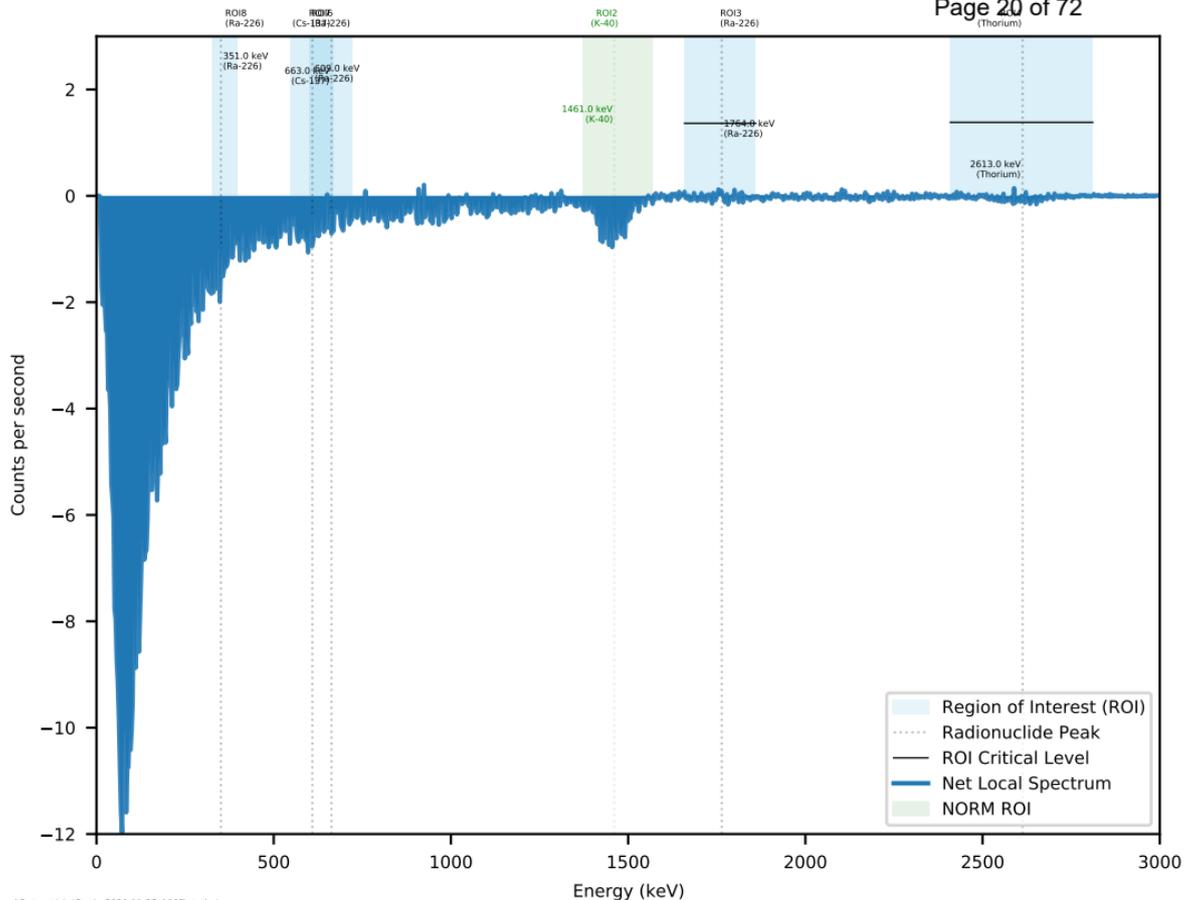


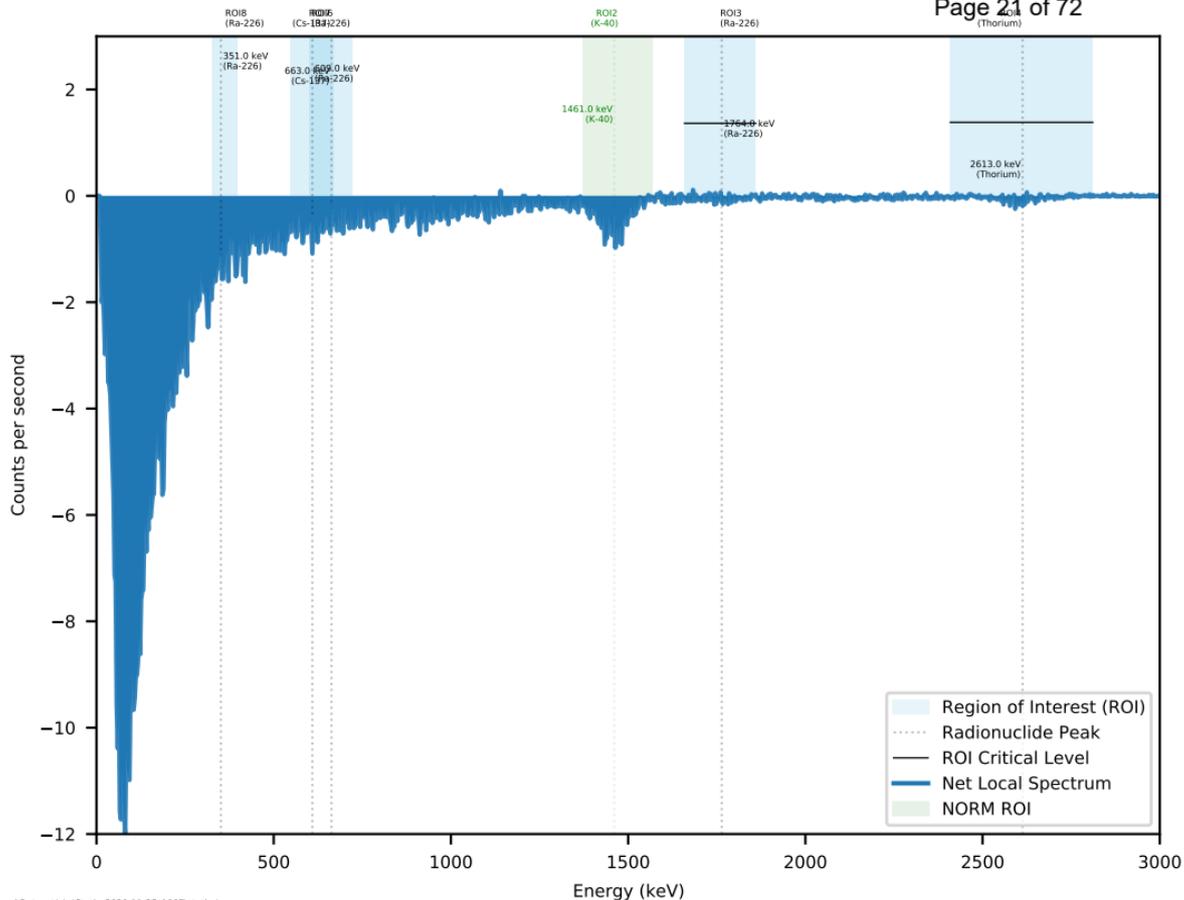














Environment Testing
America

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40596-1
Laboratory Sample Delivery Group: GJ46599740
Client Project/Site: HPNS-Parcel G 501197
Revision: 2

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/14/2021 2:52:01 PM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@Eurofinset.com

LINKS

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results through
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www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Case Narrative

Page 24 of 72

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
SDG: GJ46599740

Job ID: 160-40596-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40596-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Updated isotopic thorium to report DLC.

Revision 2- Additional information requested in case narrative for total strontium

Case Narrative

Page 25 of 72

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
SDG: GJ46599740

Job ID: 160-40596-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT

The samples were received on 11/27/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 15.6 C.

STRONTIUM-90 (GFPC)

Samples HPPG-ESU-TU107B-001 (160-40596-1), HPPG-ESU-TU107B-011 (160-40596-11) and HPPG-ESU-TU107B-021 (160-40596-21) were analyzed for Strontium-90 (GFPC) in accordance with EPA 905. The samples were dried on 12/01/2020, prepared on 12/09/2020 and analyzed on 12/18/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-ESU-TU107B-001 (160-40596-1), HPPG-ESU-TU107B-011 (160-40596-11) and HPPG-ESU-TU107B-021 (160-40596-21).

The method blank (MB) z-score is within limits and is stored in the level IV raw data. (MB 160-491323/23-A)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples HPPG-ESU-TU107B-001 (160-40596-1), HPPG-ESU-TU107B-011 (160-40596-11) and HPPG-ESU-TU107B-021 (160-40596-21) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with DOE A01R_Th. The samples were dried on 12/01/2020, prepared on 12/15/2020 and analyzed on 12/30/2020.

A blank population correction was applied to account for contributions to the analyte count rate from sources other than the sample itself. Interferences may include, but are not limited to, impurities in reagents, tracers, or glassware, or effects due to the measurement process (such as tailing or crosstalk). HPPG-ESU-TU107B-001 (160-40596-1), HPPG-ESU-TU107B-011 (160-40596-11), HPPG-ESU-TU107B-021 (160-40596-21), (LCS 160-491944/2-A), (MB 160-491944/1-A), (160-40595-A-1-D) and (160-40595-A-1-E DU)

Results for the method blank (MB) are negative more than 3 times the 1 total propagated uncertainty (TPU). This appears to be random in nature, and does not affect the sample results. The magnitude of the negative results is minimal compared to the client sample results. The laboratory does not believe this excursion adversely affects the data. (MB 160-491944/1-A)

The calibration was performed in December therefore CCV was not needed. HPPG-ESU-TU107B-001 (160-40596-1).

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples HPPG-ESU-TU107B-001 (160-40596-1), HPPG-ESU-TU107B-002 (160-40596-2), HPPG-ESU-TU107B-003 (160-40596-3), HPPG-ESU-TU107B-004 (160-40596-4), HPPG-ESU-TU107B-005 (160-40596-5), HPPG-ESU-TU107B-006 (160-40596-6), HPPG-ESU-TU107B-007 (160-40596-7), HPPG-ESU-TU107B-008 (160-40596-8), HPPG-ESU-TU107B-009 (160-40596-9), HPPG-ESU-TU107B-010 (160-40596-10), HPPG-ESU-TU107B-011 (160-40596-11), HPPG-ESU-TU107B-012 (160-40596-12), HPPG-ESU-TU107B-013 (160-40596-13), HPPG-ESU-TU107B-014 (160-40596-14), HPPG-ESU-TU107B-015 (160-40596-15), HPPG-ESU-TU107B-016 (160-40596-16), HPPG-ESU-TU107B-017 (160-40596-17), HPPG-ESU-TU107B-018 (160-40596-18), HPPG-ESU-TU107B-019 (160-40596-19), HPPG-ESU-TU107B-020 (160-40596-20), HPPG-ESU-TU107B-021 (160-40596-21), HPPG-ESU-TU107B-022 (160-40596-22), HPPG-ESU-TU107B-023 (160-40596-23), HPPG-ESU-TU107B-024 (160-40596-24), HPPG-ESU-TU107B-025 (160-40596-25), HPPG-F-049 (160-40596-26) and HPPG-F-050 (160-40596-27) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 12/01/2020, prepared on 12/03/2020 and 12/04/2020 and analyzed on 12/25/2020 and 12/30/2020.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from Reported to Analyte

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
SDG: GJ46599740

Job ID: 160-40596-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

Gamma prep batch 490932

The method blank (MB) z-score associated with Prep Batch 160-490932 is within limits and is stored in the level IV raw data. (MB 160-490932/1-A)

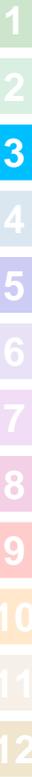
The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. HPPG-ESU-TU107B-020 (160-40596-20)

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU for Pb-210: HPPG-ESU-TU107B-021 (160-40596-21). This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

Gamma Prep Batch 490832

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU for Pb-210: HPPG-ESU-TU107B-004 (160-40596-4). This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.





CHAIN OF CUSTODY

Ref. Document # 501197RSY-046

APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin

Sample Tech(s): Andrew Murri
Paul LeBlanc

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 11/25/2020
Waybill Number: 4957 0225 6192
Lab Destination: Test America (St. Louis Lab)
13715 Rider Trail North
Earth City, MO 63046

Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

Sample ID	Collection Information			Matrix	# of Containers	Container Type	Analysis Requested						Evidence Bag ID	Comment	
	Date	Time	Method				Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma	Strontium-90 (EPA 905 MOD)	Isotopic Th(228, 230, 232)	Dose Rate uR/Hr					
							Preservatives (water)	Preservatives (soil)							
HPPG-ESU-TU107B-009	11/24/2020	15:34	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-010	11/24/2020	15:36	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-011	11/24/2020	15:37	G	SO	1	16 oz. plastic jar	X		X	X		4	GJ46599740		
HPPG-ESU-TU107B-012	11/24/2020	15:39	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-013	11/24/2020	15:40	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-014	11/24/2020	15:41	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-015	11/24/2020	15:43	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-016	11/24/2020	15:44	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-017	11/24/2020	15:45	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-018	11/24/2020	15:47	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-019	11/24/2020	15:48	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-020	11/24/2020	15:51	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-021	11/24/2020	15:52	G	SO	1	16 oz. plastic jar	X		X	X		4	GJ46599740		
HPPG-ESU-TU107B-022	11/24/2020	15:53	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-023	11/24/2020	15:55	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-024	11/24/2020	15:57	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		
HPPG-ESU-TU107B-025	11/24/2020	16:01	G	SO	1	16 oz. plastic jar	X					4	GJ46599740		

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CHAIN OF CUSTODY

Ref. Document # 501197RSY-046

APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin

Sample Tech(s): Andrew Murri
Paul LeBlanc

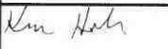
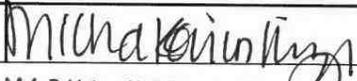
Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 11/25/2020
Waybill Number: 4957 0225 6192
Lab Destination: Test America (St. Louis Lab)
13715 Rider Trail North
Earth City, MO 63046

Lab Contact Name/ph #: Rhoeda Ridenbower (314)298-8566

							Analysis Requested						Evidence Bag ID	Comment
Sample ID	Date	Time	Method	Matrix	# of Containers	Container Type	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma	Strontium-90 (EPA 905 MOD)	Isotopic Th(228, 230, 232)	Dose Rate uR/Hr				
							Preservatives (water)							
							Preservatives (soil)							
							Container Type							
HPPG-F-049	11/24/2020	15:26	G	SO	1	16 oz. plastic jar	X				4	GJ46599740		
HPPG-F-050	11/24/2020	15:44	G	SO	1	16 oz. plastic jar	X				4	GJ46599740		



All Transfers for COC 501197RSY-046

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		11/24/2020 17:00	Locked Storage(Kevin Hoch)		11/24/2020 17:00
Locked Storage(Kevin Hoch)		11/25/2020 07:39	Devin Lewis		11/25/2020 07:39
Devin Lewis		11/25/2020 11:35	SHIPPEDTOLAB	 MICHA KORRINHIZER	11/27/2020 09:12

MICHA KORRINHIZER



Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40596-1

SDG Number: GJ46599740

Login Number: 40596**List Source: Eurofins TestAmerica, St. Louis****List Number: 1****Creator: Greer, Diane A**

Question	Answer	Comment
Radioactivity wasn't checked or is < /= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is < 6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
SDG: GJ46599740

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
SDG: GJ46599740

Method	Method Description	Protocol	Laboratory
905	Strontium-90 (GFPC)	EPA	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-7	Preparation, Digestion/Precipitate Separation (7-Day In-Growth)	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

- DOE = U.S. Department of Energy
- EPA = US Environmental Protection Agency
- None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



Sample Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
SDG: GJ46599740

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40596-1	HPPG-ESU-TU107B-001	Solid	11/24/20 15:22	11/27/20 09:12	
160-40596-2	HPPG-ESU-TU107B-002	Solid	11/24/20 15:23	11/27/20 09:12	
160-40596-3	HPPG-ESU-TU107B-003	Solid	11/24/20 15:25	11/27/20 09:12	
160-40596-4	HPPG-ESU-TU107B-004	Solid	11/24/20 15:26	11/27/20 09:12	
160-40596-5	HPPG-ESU-TU107B-005	Solid	11/24/20 15:28	11/27/20 09:12	
160-40596-6	HPPG-ESU-TU107B-006	Solid	11/24/20 15:29	11/27/20 09:12	
160-40596-7	HPPG-ESU-TU107B-007	Solid	11/24/20 15:31	11/27/20 09:12	
160-40596-8	HPPG-ESU-TU107B-008	Solid	11/24/20 15:33	11/27/20 09:12	
160-40596-9	HPPG-ESU-TU107B-009	Solid	11/24/20 15:34	11/27/20 09:12	
160-40596-10	HPPG-ESU-TU107B-010	Solid	11/24/20 15:36	11/27/20 09:12	
160-40596-11	HPPG-ESU-TU107B-011	Solid	11/24/20 15:37	11/27/20 09:12	
160-40596-12	HPPG-ESU-TU107B-012	Solid	11/24/20 15:39	11/27/20 09:12	
160-40596-13	HPPG-ESU-TU107B-013	Solid	11/24/20 15:40	11/27/20 09:12	
160-40596-14	HPPG-ESU-TU107B-014	Solid	11/24/20 15:41	11/27/20 09:12	
160-40596-15	HPPG-ESU-TU107B-015	Solid	11/24/20 15:43	11/27/20 09:12	
160-40596-16	HPPG-ESU-TU107B-016	Solid	11/24/20 15:44	11/27/20 09:12	
160-40596-17	HPPG-ESU-TU107B-017	Solid	11/24/20 15:45	11/27/20 09:12	
160-40596-18	HPPG-ESU-TU107B-018	Solid	11/24/20 15:47	11/27/20 09:12	
160-40596-19	HPPG-ESU-TU107B-019	Solid	11/24/20 15:48	11/27/20 09:12	
160-40596-20	HPPG-ESU-TU107B-020	Solid	11/24/20 15:51	11/27/20 09:12	
160-40596-21	HPPG-ESU-TU107B-021	Solid	11/24/20 15:52	11/27/20 09:12	
160-40596-22	HPPG-ESU-TU107B-022	Solid	11/24/20 15:53	11/27/20 09:12	
160-40596-23	HPPG-ESU-TU107B-023	Solid	11/24/20 15:55	11/27/20 09:12	
160-40596-24	HPPG-ESU-TU107B-024	Solid	11/24/20 15:57	11/27/20 09:12	
160-40596-25	HPPG-ESU-TU107B-025	Solid	11/24/20 16:01	11/27/20 09:12	
160-40596-26	HPPG-F-049	Solid	11/24/20 15:26	11/27/20 09:12	
160-40596-27	HPPG-F-050	Solid	11/24/20 15:44	11/27/20 09:12	

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-001

Lab Sample ID: 160-40596-1

Date Collected: 11/24/20 15:22

Matrix: Solid

Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	0.270		0.160	0.162	0.331	0.111	pCi/g	12/09/20 18:42	12/18/20 20:14	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	97.1		40 - 110					12/09/20 18:42	12/18/20 20:14	1
Y Carrier	96.8		40 - 110					12/09/20 18:42	12/18/20 20:14	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.322		0.0647	0.0702	0.250	0.0213	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.276		0.0678	0.0717	0.250	0.0257	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.357		0.0605	0.0675	0.250	0.00887	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	70.1		30 - 110					12/15/20 14:37	12/30/20 10:45	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.486		0.134	0.142		0.0214	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Actinium-227	-0.00489	U	0.0217	0.0217		0.308	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Bismuth-212	0.258	U	0.449	0.450		0.340	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Bismuth-214	0.400		0.103	0.111		0.0396	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Cesium-137	0.00122	U	0.0351	0.0351	0.0700	0.0288	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Lead-210	0.0517	U	1.10	1.10		0.903	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Lead-212	0.319		0.0686	0.0800		0.0341	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Lead-214	0.367		0.0934	0.101		0.0398	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Potassium-40	7.65		1.09	1.35		0.240	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Protactinium-231	0.000	U	0.452	0.452		1.66	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Protactinium-234	-0.0783	U	0.224	0.224		0.182	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Radium-226	0.400		0.103	0.111	0.200	0.0396	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Radium-228	0.486		0.134	0.142		0.0214	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Thallium-208	0.143		0.0376	0.0404		0.0102	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Thorium 228	0.319		0.0686	0.0800		0.0341	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Thorium-232	0.486		0.134	0.142		0.0214	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Thorium-234	0.439		0.291	0.295		0.204	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Uranium-235	0.0867	U	0.173	0.173		0.329	pCi/g	12/03/20 14:31	12/30/20 06:34	1
Uranium-238	0.439		0.291	0.295		0.204	pCi/g	12/03/20 14:31	12/30/20 06:34	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-002

Lab Sample ID: 160-40596-2

Date Collected: 11/24/20 15:23

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.351		0.124	0.129		0.0858	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Actinium-227	0.122	U	0.235	0.236		0.227	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Bismuth-212	0.00443	U	0.504	0.504		0.415	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Bismuth-214	0.333		0.0922	0.0985		0.0383	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Cesium-137	0.0710		0.0297	0.0306	0.0700	0.0132	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Lead-210	0.449	U	0.979	0.980		0.783	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Lead-212	0.387		0.0659	0.0828		0.0272	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Lead-214	0.291		0.0768	0.0825		0.0344	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Potassium-40	6.84		0.997	1.22		0.161	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Protactinium-231	0.386	U	1.20	1.20		1.31	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Protactinium-234	-0.0870	U	0.240	0.240		0.196	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Radium-226	0.333		0.0922	0.0985	0.200	0.0383	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Radium-228	0.351		0.124	0.129		0.0858	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Thallium-208	0.171		0.0415	0.0452		0.00958	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Thorium 228	0.387		0.0659	0.0828		0.0272	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Thorium-232	0.351		0.124	0.129		0.0858	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Thorium-234	-0.263	U	0.940	0.941		0.769	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Uranium-235	0.0675	U	0.259	0.259		0.211	pCi/g	12/03/20 14:31	12/30/20 07:03	1
Uranium-238	-0.263	U	0.940	0.941		0.769	pCi/g	12/03/20 14:31	12/30/20 07:03	1

Client Sample ID: HPPG-ESU-TU107B-003

Lab Sample ID: 160-40596-3

Date Collected: 11/24/20 15:25

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.484		0.180	0.187		0.0638	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Actinium-227	0.122	U	0.345	0.345		0.292	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Bismuth-212	-0.0266	U	0.750	0.750		0.615	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Bismuth-214	0.366		0.130	0.135		0.0656	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Cesium-137	0.000	U	0.00935	0.00935	0.0700	0.0400	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Lead-210	-1.20	U	1.72	1.72		1.46	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Lead-212	0.390		0.0886	0.0975		0.0453	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Lead-214	0.435		0.111	0.120		0.0482	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Potassium-40	7.88		1.22	1.46		0.111	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Protactinium-231	-0.822	U	2.81	2.81		2.29	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Protactinium-234	0.126	U	0.234	0.234		0.192	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Radium-226	0.366		0.130	0.135	0.200	0.0656	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Radium-228	0.484		0.180	0.187		0.0638	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Thallium-208	0.182		0.0516	0.0548		0.0123	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Thorium 228	0.390		0.0886	0.0975		0.0453	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Thorium-232	0.484		0.180	0.187		0.0638	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Thorium-234	0.227	U	0.270	0.271		0.865	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Uranium-235	0.100	U	0.0968	0.0974		0.264	pCi/g	12/03/20 14:31	12/30/20 06:59	1
Uranium-238	0.227	U	0.270	0.271		0.865	pCi/g	12/03/20 14:31	12/30/20 06:59	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-004

Lab Sample ID: 160-40596-4

Date Collected: 11/24/20 15:26

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.487		0.165	0.172		0.0308	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Actinium-227	0.143	U	0.282	0.283		0.372	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Bismuth-212	-0.0413	U	0.666	0.666		0.544	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Bismuth-214	0.432		0.131	0.139		0.0497	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Cesium-137	-0.0209	U	0.0568	0.0568	0.0700	0.0447	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Lead-210	-1.54	U	0.715	0.738		1.46	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Lead-212	0.302		0.0838	0.0925		0.0480	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Lead-214	0.291		0.111	0.115		0.0676	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Potassium-40	7.36		1.29	1.49		0.229	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Protactinium-231	0.101	U	1.18	1.18		1.92	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Protactinium-234	0.101	U	0.225	0.226		0.190	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Radium-226	0.432		0.131	0.139	0.200	0.0497	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Radium-228	0.487		0.165	0.172		0.0308	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Thallium-208	0.124		0.0570	0.0585		0.0244	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Thorium 228	0.302		0.0838	0.0925		0.0480	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Thorium-232	0.487		0.165	0.172		0.0308	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Thorium-234	-0.0311	U	1.18	1.18		0.969	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Uranium-235	0.145	U	0.347	0.347		0.303	pCi/g	12/03/20 14:31	12/30/20 06:57	1
Uranium-238	-0.0311	U	1.18	1.18		0.969	pCi/g	12/03/20 14:31	12/30/20 06:57	1

Client Sample ID: HPPG-ESU-TU107B-005

Lab Sample ID: 160-40596-5

Date Collected: 11/24/20 15:28

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.401		0.144	0.151		0.0301	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Actinium-227	0.556		0.416	0.421		0.223	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Bismuth-212	0.000	U	0.168	0.168		0.470	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Bismuth-214	0.342		0.114	0.120		0.0452	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Cesium-137	0.0304	U	0.0615	0.0616	0.0700	0.0477	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Lead-210	1.13		1.27	1.28		0.842	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Lead-212	0.246		0.0831	0.0880		0.0509	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Lead-214	0.373		0.121	0.128		0.0662	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Potassium-40	7.98		1.31	1.60		0.266	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Protactinium-231	0.000	U	0.652	0.652		2.32	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Protactinium-234	0.0938	U	0.284	0.285		0.231	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Radium-226	0.342		0.114	0.120	0.200	0.0452	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Radium-228	0.401		0.144	0.151		0.0301	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Thallium-208	0.0987		0.0507	0.0520		0.0247	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Thorium 228	0.246		0.0831	0.0880		0.0509	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Thorium-232	0.401		0.144	0.151		0.0301	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Thorium-234	-0.571	U	0.609	0.613		0.555	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Uranium-235	-0.199	U	0.325	0.326		0.426	pCi/g	12/03/20 14:31	12/30/20 07:09	1
Uranium-238	-0.571	U	0.609	0.613		0.555	pCi/g	12/03/20 14:31	12/30/20 07:09	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-006

Lab Sample ID: 160-40596-6

Date Collected: 11/24/20 15:29

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.413		0.131	0.137		0.0240	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Actinium-227	0.157	U	0.243	0.244		0.228	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Bismuth-212	-0.0000000	U	0.576	0.576		0.474	pCi/g	12/03/20 14:31	12/30/20 07:46	1
	0399									
Bismuth-214	0.382		0.127	0.133		0.0485	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Cesium-137	-0.0180	U	0.0523	0.0523	0.0700	0.0415	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Lead-210	0.198	U	1.02	1.02		0.814	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Lead-212	0.00735	U	0.0943	0.0943		0.0771	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Lead-214	0.355		0.0962	0.103		0.0394	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Potassium-40	7.15		1.11	1.33		0.223	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Protactinium-231	0.000	U	0.721	0.721		1.90	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Protactinium-234	0.0697	U	0.0958	0.0961		0.217	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Radium-226	0.382		0.127	0.133	0.200	0.0485	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Radium-228	0.413		0.131	0.137		0.0240	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Thallium-208	0.163		0.0438	0.0470		0.0127	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Thorium 228	0.00735	U	0.0943	0.0943		0.0771	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Thorium-232	0.413		0.131	0.137		0.0240	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Thorium-234	0.298	U	0.504	0.505		0.397	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Uranium-235	0.0691	U	0.470	0.470		0.385	pCi/g	12/03/20 14:31	12/30/20 07:46	1
Uranium-238	0.298	U	0.504	0.505		0.397	pCi/g	12/03/20 14:31	12/30/20 07:46	1

Client Sample ID: HPPG-ESU-TU107B-007

Lab Sample ID: 160-40596-7

Date Collected: 11/24/20 15:31

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.275		0.188	0.190		0.0789	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Actinium-227	0.223	U	0.416	0.417		0.234	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Bismuth-212	-0.335	U	0.888	0.889		0.704	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Bismuth-214	0.103	U	0.101	0.102		0.159	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Cesium-137	-0.0188	U	0.0572	0.0572	0.0700	0.0451	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Lead-210	-0.00413	U	1.51	1.51		1.23	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Lead-212	0.266		0.0924	0.0987		0.0590	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Lead-214	0.473		0.120	0.130		0.0393	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Potassium-40	8.14		1.39	1.62		0.243	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Protactinium-231	0.000	U	0.277	0.277		2.12	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Protactinium-234	0.0850	U	0.237	0.238		0.193	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Radium-226	0.103	U	0.101	0.102	0.200	0.159	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Radium-228	0.275		0.188	0.190		0.0789	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Thallium-208	0.154		0.0495	0.0521		0.0151	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Thorium 228	0.266		0.0924	0.0987		0.0590	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Thorium-232	0.275		0.188	0.190		0.0789	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Thorium-234	-0.416	U	0.788	0.789		0.970	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Uranium-235	0.0921	U	0.177	0.178		0.364	pCi/g	12/03/20 14:31	12/30/20 07:31	1
Uranium-238	-0.416	U	0.788	0.789		0.970	pCi/g	12/03/20 14:31	12/30/20 07:31	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-008

Lab Sample ID: 160-40596-8

Date Collected: 11/24/20 15:33

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.592		0.139	0.151		0.0288	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Actinium-227	0.220	U	0.426	0.426		0.252	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Bismuth-212	-0.0135	U	0.700	0.700		0.575	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Bismuth-214	0.394		0.127	0.133		0.0564	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Cesium-137	-0.0490	U	0.0819	0.0820	0.0700	0.0641	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Lead-210	0.856	U	1.21	1.21		0.925	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Lead-212	0.392		0.0882	0.0972		0.0442	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Lead-214	0.457		0.101	0.111		0.0523	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Potassium-40	8.35		1.27	1.52		0.112	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Protactinium-231	0.214	U	1.39	1.39		2.16	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Protactinium-234	0.00829	U	0.0153	0.0154		0.248	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Radium-226	0.394		0.127	0.133	0.200	0.0564	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Radium-228	0.592		0.139	0.151		0.0288	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Thallium-208	0.203		0.0499	0.0540		0.00716	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Thorium 228	0.392		0.0882	0.0972		0.0442	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Thorium-232	0.592		0.139	0.151		0.0288	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Thorium-234	0.817		0.528	0.536		0.424	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Uranium-235	0.0493	U	0.0778	0.0780		0.443	pCi/g	12/03/20 14:31	12/30/20 07:34	1
Uranium-238	0.817		0.528	0.536		0.424	pCi/g	12/03/20 14:31	12/30/20 07:34	1

Client Sample ID: HPPG-ESU-TU107B-009

Lab Sample ID: 160-40596-9

Date Collected: 11/24/20 15:34

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.464		0.131	0.140		0.0210	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Actinium-227	0.206	U	0.415	0.416		0.238	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Bismuth-212	0.164	U	0.442	0.443		0.346	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Bismuth-214	0.303		0.110	0.115		0.0525	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Cesium-137	-0.0194	U	0.0480	0.0481	0.0700	0.0379	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Lead-210	-0.595	U	1.29	1.29		1.04	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Lead-212	0.377		0.0672	0.0830		0.0268	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Lead-214	0.369		0.0877	0.0957		0.0376	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Potassium-40	6.85		1.15	1.35		0.287	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Protactinium-231	0.266	U	0.979	0.979		1.53	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Protactinium-234	-0.0158	U	0.0379	0.0380		0.191	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Radium-226	0.303		0.110	0.115	0.200	0.0525	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Radium-228	0.464		0.131	0.140		0.0210	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Thallium-208	0.194		0.0413	0.0459		0.00512	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Thorium 228	0.377		0.0672	0.0830		0.0268	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Thorium-232	0.464		0.131	0.140		0.0210	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Thorium-234	0.420		0.323	0.326		0.236	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Uranium-235	0.0699	U	0.159	0.160		0.351	pCi/g	12/03/20 14:31	12/30/20 07:36	1
Uranium-238	0.420		0.323	0.326		0.236	pCi/g	12/03/20 14:31	12/30/20 07:36	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-010

Lab Sample ID: 160-40596-10

Date Collected: 11/24/20 15:36

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.376		0.214	0.218		0.0810	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Actinium-227	0.0585	U	0.256	0.256		0.310	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Bismuth-212	-0.00400	U	0.939	0.939		0.689	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Bismuth-214	0.281		0.146	0.149		0.0704	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Cesium-137	-0.0457	U	0.0761	0.0763	0.0700	0.0618	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Lead-210	-0.337	U	1.32	1.32		0.955	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Lead-212	0.378		0.0834	0.0967		0.0328	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Lead-214	0.301		0.0912	0.0964		0.0661	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Potassium-40	6.95		1.54	1.70		0.434	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Protactinium-231	0.355	U	1.36	1.36		1.50	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Protactinium-234	0.161		0.107	0.108		0.137	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Radium-226	0.281		0.146	0.149	0.200	0.0704	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Radium-228	0.376		0.214	0.218		0.0810	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Thallium-208	0.114		0.0506	0.0520		0.0200	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Thorium 228	0.378		0.0834	0.0967		0.0328	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Thorium-232	0.376		0.214	0.218		0.0810	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Thorium-234	-0.175	U	0.820	0.821		0.681	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Uranium-235	0.104	U	0.271	0.272		0.182	pCi/g	12/03/20 14:31	12/30/20 07:37	1
Uranium-238	-0.175	U	0.820	0.821		0.681	pCi/g	12/03/20 14:31	12/30/20 07:37	1

Client Sample ID: HPPG-ESU-TU107B-011

Lab Sample ID: 160-40596-11

Date Collected: 11/24/20 15:37

Matrix: Solid

Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Strontium-90	0.0186	U	0.141	0.141	0.331	0.114	pCi/g	12/09/20 18:42	12/18/20 20:14	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	97.1		40 - 110					12/09/20 18:42	12/18/20 20:14	1
Y Carrier	95.7		40 - 110					12/09/20 18:42	12/18/20 20:14	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Thorium-228	0.331		0.0706	0.0759	0.250	0.0342	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.247		0.0635	0.0668	0.250	0.0264	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.318		0.0546	0.0608	0.250	0.00967	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	78.8		30 - 110					12/15/20 14:37	12/30/20 10:45	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-011

Lab Sample ID: 160-40596-11

Date Collected: 11/24/20 15:37

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.530		0.174	0.185		0.0334	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Actinium-227	0.0781	U	0.373	0.374		0.318	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Bismuth-212	0.421	U	0.753	0.754		0.575	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Bismuth-214	0.473		0.120	0.132		0.0402	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Cesium-137	0.0256	U	0.0603	0.0603	0.0700	0.0469	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Lead-210	0.985		1.41	1.42		0.948	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Lead-212	0.372		0.0995	0.109		0.0568	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Lead-214	0.237		0.0814	0.0859		0.124	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Potassium-40	8.78		1.45	1.76		0.295	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Protactinium-231	0.000	U	0.175	0.175		2.48	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Protactinium-234	-0.0187	U	0.0394	0.0395		0.278	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Radium-226	0.473		0.120	0.132	0.200	0.0402	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Radium-228	0.530		0.174	0.185		0.0334	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Thallium-208	0.130		0.113	0.114		0.0511	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Thorium 228	0.372		0.0995	0.109		0.0568	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Thorium-232	0.530		0.174	0.185		0.0334	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Thorium-234	-0.448	U	0.991	0.993		0.828	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Uranium-235	-0.214	U	0.320	0.321		0.367	pCi/g	12/03/20 14:31	12/30/20 07:45	1
Uranium-238	-0.448	U	0.991	0.993		0.828	pCi/g	12/03/20 14:31	12/30/20 07:45	1

Client Sample ID: HPPG-ESU-TU107B-012

Lab Sample ID: 160-40596-12

Date Collected: 11/24/20 15:39

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.247		0.114	0.117		0.105	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Actinium-227	0.0470	U	0.197	0.198		0.265	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Bismuth-212	0.205	U	0.411	0.411		0.306	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Bismuth-214	0.351		0.113	0.118		0.0478	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Cesium-137	-0.0226	U	0.0494	0.0495	0.0700	0.0383	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Lead-210	0.792	U	1.35	1.35		0.868	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Lead-212	0.313		0.0785	0.0850		0.0408	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Lead-214	0.373		0.102	0.109		0.0436	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Potassium-40	7.51		1.17	1.39		0.105	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Protactinium-231	0.188	U	1.30	1.30		2.01	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Protactinium-234	0.0755	U	0.229	0.229		0.188	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Radium-226	0.351		0.113	0.118	0.200	0.0478	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Radium-228	0.247		0.114	0.117		0.105	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Thallium-208	0.154		0.0515	0.0538		0.0140	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Thorium 228	0.313		0.0785	0.0850		0.0408	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Thorium-232	0.247		0.114	0.117		0.105	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Thorium-234	-0.835	U	0.587	0.595		0.759	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Uranium-235	0.0535	U	0.199	0.199		0.395	pCi/g	12/03/20 14:31	12/30/20 08:08	1
Uranium-238	-0.835	U	0.587	0.595		0.759	pCi/g	12/03/20 14:31	12/30/20 08:08	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-013

Lab Sample ID: 160-40596-13

Date Collected: 11/24/20 15:40

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.346		0.112	0.118		0.0582	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Actinium-227	0.0648	U	0.370	0.370		0.218	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Bismuth-212	0.204	U	0.351	0.352		0.264	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Bismuth-214	0.287		0.0793	0.0847		0.0326	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Cesium-137	-0.0304	U	0.0471	0.0472	0.0700	0.0365	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Lead-210	0.118	U	0.789	0.789		0.642	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Lead-212	0.280		0.0585	0.0688		0.0280	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Lead-214	0.261		0.0728	0.0776		0.0480	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Potassium-40	6.92		0.929	1.17		0.0727	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Protactinium-231	-0.0000001	U	1.77	1.77		1.46	pCi/g	12/03/20 14:31	12/30/20 08:09	1
	35									
Protactinium-234	0.0633	U	0.178	0.178		0.145	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Radium-226	0.287		0.0793	0.0847	0.200	0.0326	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Radium-228	0.346		0.112	0.118		0.0582	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Thallium-208	0.137		0.0392	0.0417		0.0102	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Thorium 228	0.280		0.0585	0.0688		0.0280	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Thorium-232	0.346		0.112	0.118		0.0582	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Thorium-234	-0.276	U	0.809	0.810		0.660	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Uranium-235	0.0293	U	0.173	0.173		0.259	pCi/g	12/03/20 14:31	12/30/20 08:09	1
Uranium-238	-0.276	U	0.809	0.810		0.660	pCi/g	12/03/20 14:31	12/30/20 08:09	1

Client Sample ID: HPPG-ESU-TU107B-014

Lab Sample ID: 160-40596-14

Date Collected: 11/24/20 15:41

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.379		0.211	0.215		0.0926	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Actinium-227	-0.152	U	0.151	0.152		0.322	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Bismuth-212	-0.0259	U	0.695	0.695		0.690	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Bismuth-214	0.353		0.0809	0.0888		0.0108	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Cesium-137	0.0182	U	0.0494	0.0495	0.0700	0.0391	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Lead-210	-1.25	U	1.22	1.23		1.29	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Lead-212	0.286		0.0718	0.0808		0.0386	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Lead-214	0.360		0.0951	0.102		0.0389	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Potassium-40	7.81		1.15	1.40		0.252	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Protactinium-231	0.272	U	0.938	0.939		1.46	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Protactinium-234	0.0439	U	0.0794	0.0795		0.157	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Radium-226	0.353		0.0809	0.0888	0.200	0.0108	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Radium-228	0.379		0.211	0.215		0.0926	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Thallium-208	0.114		0.0432	0.0448		0.0171	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Thorium 228	0.286		0.0718	0.0808		0.0386	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Thorium-232	0.379		0.211	0.215		0.0926	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Thorium-234	-0.320	U	0.744	0.744		0.690	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Uranium-235	0.183		0.153	0.155		0.0967	pCi/g	12/03/20 14:31	12/30/20 08:13	1
Uranium-238	-0.320	U	0.744	0.744		0.690	pCi/g	12/03/20 14:31	12/30/20 08:13	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-015

Lab Sample ID: 160-40596-15

Date Collected: 11/24/20 15:43

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.343		0.185	0.189		0.0845	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Actinium-227	0.137	U	0.362	0.363		0.305	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Bismuth-212	-0.594	U	0.828	0.830		0.935	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Bismuth-214	0.172	U	0.139	0.141		0.177	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Cesium-137	-0.0351	U	0.128	0.128	0.0700	0.0611	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Lead-210	0.572	U	1.30	1.30		0.894	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Lead-212	0.311		0.0896	0.0982		0.0481	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Lead-214	0.263		0.119	0.122		0.0813	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Potassium-40	6.53		1.37	1.53		0.267	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Protactinium-231	-0.879	U	2.83	2.83		2.30	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Protactinium-234	0.00963	U	0.0250	0.0250		0.174	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Radium-226	0.172	U	0.139	0.141	0.200	0.177	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Radium-228	0.343		0.185	0.189		0.0845	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Thallium-208	0.160		0.0538	0.0563		0.0148	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Thorium 228	0.311		0.0896	0.0982		0.0481	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Thorium-232	0.343		0.185	0.189		0.0845	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Thorium-234	-0.115	U	0.842	0.842		0.697	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Uranium-235	-0.0388	U	0.0688	0.0690		0.327	pCi/g	12/03/20 14:31	12/30/20 08:12	1
Uranium-238	-0.115	U	0.842	0.842		0.697	pCi/g	12/03/20 14:31	12/30/20 08:12	1

Client Sample ID: HPPG-ESU-TU107B-016

Lab Sample ID: 160-40596-16

Date Collected: 11/24/20 15:44

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.359		0.141	0.145		0.129	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Actinium-227	0.118	U	0.312	0.313		0.345	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Bismuth-212	-0.314	U	0.761	0.762		0.597	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Bismuth-214	0.302		0.101	0.106		0.0413	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Cesium-137	-0.00359	U	0.0492	0.0492	0.0700	0.0401	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Lead-210	-0.590	U	1.30	1.30		1.09	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Lead-212	0.206		0.0991	0.103		0.0510	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Lead-214	0.182		0.0948	0.0966		0.101	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Potassium-40	6.39		1.24	1.40		0.243	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Protactinium-231	0.393	U	1.36	1.36		1.50	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Protactinium-234	-0.106	U	0.282	0.282		0.229	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Radium-226	0.302		0.101	0.106	0.200	0.0413	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Radium-228	0.359		0.141	0.145		0.129	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Thallium-208	0.128		0.0500	0.0517		0.0198	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Thorium 228	0.206		0.0991	0.103		0.0510	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Thorium-232	0.359		0.141	0.145		0.129	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Thorium-234	0.571		0.625	0.629		0.359	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Uranium-235	0.0701	U	0.206	0.206		0.417	pCi/g	12/03/20 14:31	12/30/20 08:03	1
Uranium-238	0.571		0.625	0.629		0.359	pCi/g	12/03/20 14:31	12/30/20 08:03	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-017

Lab Sample ID: 160-40596-17

Date Collected: 11/24/20 15:45

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.215		0.230	0.231		0.132	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Actinium-227	0.226	U	0.458	0.459		0.273	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Bismuth-212	0.987		0.632	0.640		0.280	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Bismuth-214	0.411		0.112	0.120		0.0457	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Cesium-137	-0.0214	U	0.0688	0.0689	0.0700	0.0551	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Lead-210	0.670	U	1.43	1.43		1.14	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Lead-212	0.372		0.0905	0.103		0.0501	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Lead-214	0.446		0.130	0.138		0.0543	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Potassium-40	7.84		1.24	1.48		0.253	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Protactinium-231	-0.811	U	3.05	3.05		2.49	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Protactinium-234	0.0778	U	0.285	0.285		0.232	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Radium-226	0.411		0.112	0.120	0.200	0.0457	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Radium-228	0.215		0.230	0.231		0.132	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Thallium-208	0.155		0.0579	0.0601		0.0235	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Thorium 228	0.372		0.0905	0.103		0.0501	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Thorium-232	0.215		0.230	0.231		0.132	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Thorium-234	0.566		0.468	0.473		0.412	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Uranium-235	-0.170	U	0.539	0.539		0.440	pCi/g	12/03/20 14:31	12/30/20 08:18	1
Uranium-238	0.566		0.468	0.473		0.412	pCi/g	12/03/20 14:31	12/30/20 08:18	1

Client Sample ID: HPPG-ESU-TU107B-018

Lab Sample ID: 160-40596-18

Date Collected: 11/24/20 15:47

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.171		0.241	0.242		0.152	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Actinium-227	0.139	U	0.475	0.475		0.289	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Bismuth-212	0.221	U	0.441	0.442		0.327	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Bismuth-214	0.362		0.123	0.130		0.0517	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Cesium-137	0.0176	U	0.0401	0.0402	0.0700	0.0304	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Lead-210	1.13		1.35	1.36		0.890	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Lead-212	0.294		0.0833	0.0902		0.0468	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Lead-214	0.319		0.0975	0.104		0.0500	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Potassium-40	5.24		1.57	1.68		0.624	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Protactinium-231	0.413	U	1.62	1.62		2.00	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Protactinium-234	-0.0377	U	0.0857	0.0859		0.275	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Radium-226	0.362		0.123	0.130	0.200	0.0517	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Radium-228	0.171		0.241	0.242		0.152	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Thallium-208	0.0950		0.0715	0.0723		0.0308	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Thorium 228	0.294		0.0833	0.0902		0.0468	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Thorium-232	0.171		0.241	0.242		0.152	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Thorium-234	0.471		0.573	0.576		0.369	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Uranium-235	0.194	U	0.197	0.199		0.401	pCi/g	12/03/20 14:31	12/30/20 08:17	1
Uranium-238	0.471		0.573	0.576		0.369	pCi/g	12/03/20 14:31	12/30/20 08:17	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-019

Lab Sample ID: 160-40596-19

Date Collected: 11/24/20 15:48

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.124	U	0.226	0.227		0.189	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Actinium-227	0.0275	U	0.556	0.556		0.345	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Bismuth-212	0.000	U	0.511	0.511		0.626	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Bismuth-214	0.358		0.111	0.118		0.0417	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Cesium-137	0.0403	U	0.0737	0.0739	0.0700	0.0570	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Lead-210	1.79		1.76	1.78		1.07	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Lead-212	0.335		0.0895	0.0978		0.0465	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Lead-214	0.0937	U	0.0837	0.0844		0.122	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Potassium-40	8.46		1.45	1.75		0.306	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Protactinium-231	-0.353	U	3.00	3.00		2.46	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Protactinium-234	0.0665	U	0.125	0.125		0.292	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Radium-226	0.358		0.111	0.118	0.200	0.0417	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Radium-228	0.124	U	0.226	0.227		0.189	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Thallium-208	0.137		0.0608	0.0628		0.0246	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Thorium 228	0.335		0.0895	0.0978		0.0465	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Thorium-232	0.124	U	0.226	0.227		0.189	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Thorium-234	0.593		0.557	0.562		0.457	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Uranium-235	0.168	U	0.596	0.597		0.486	pCi/g	12/04/20 14:01	12/25/20 09:10	1
Uranium-238	0.593		0.557	0.562		0.457	pCi/g	12/04/20 14:01	12/25/20 09:10	1

Client Sample ID: HPPG-ESU-TU107B-020

Lab Sample ID: 160-40596-20

Date Collected: 11/24/20 15:51

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.290		0.190	0.192		0.110	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Actinium-227	0.148	U	0.448	0.448		0.303	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Bismuth-212	-0.0244	U	0.754	0.754		0.619	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Bismuth-214	0.341		0.123	0.128		0.0528	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Cesium-137	-0.0132	U	0.0899	0.0899	0.0700	0.0731	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Lead-210	1.41		1.53	1.54		0.976	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Lead-212	0.430		0.0884	0.0991		0.0405	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Lead-214	0.376		0.107	0.114		0.0468	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Potassium-40	8.00		1.45	1.66		0.218	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Protactinium-231	0.641	U	1.95	1.96		2.14	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Protactinium-234	0.108	U	0.160	0.160		0.224	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Radium-226	0.341		0.123	0.128	0.200	0.0528	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Radium-228	0.290		0.190	0.192		0.110	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thallium-208	0.0764		0.103	0.103		0.0525	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thorium 228	0.430		0.0884	0.0991		0.0405	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thorium-232	0.290		0.190	0.192		0.110	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thorium-234	0.547		0.433	0.437		0.404	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Uranium-235	-0.204	U	0.276	0.277		0.413	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Uranium-238	0.547		0.433	0.437		0.404	pCi/g	12/04/20 14:01	12/25/20 09:29	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-021

Lab Sample ID: 160-40596-21

Date Collected: 11/24/20 15:52

Matrix: Solid

Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	0.0433	U	0.152	0.152	0.331	0.122	pCi/g	12/09/20 18:42	12/18/20 20:14	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	96.7		40 - 110					12/09/20 18:42	12/18/20 20:14	1
Y Carrier	91.2		40 - 110					12/09/20 18:42	12/18/20 20:14	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	1.16		0.107	0.145	0.250	0.0271	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.572		0.0863	0.0988	0.250	0.0337	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	1.25		0.105	0.149	0.250	0.0138	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	80.6		30 - 110					12/15/20 14:37	12/30/20 10:45	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.364		0.214	0.217		0.0819	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Actinium-227	0.0156	U	0.476	0.476		0.295	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Bismuth-212	0.252	U	0.738	0.738		0.577	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Bismuth-214	0.211		0.124	0.125		0.0751	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Cesium-137	0.0103	U	0.0611	0.0611	0.0700	0.0489	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Lead-210	-1.33	U	0.867	0.881		1.12	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Lead-212	0.293		0.0852	0.0933		0.0455	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Lead-214	0.322		0.0978	0.103		0.0651	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Potassium-40	5.56		1.59	1.69		0.564	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Protactinium-231	-0.669	U	2.45	2.45		1.99	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Protactinium-234	-0.0925	U	0.238	0.239		0.193	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Radium-226	0.211		0.124	0.125	0.200	0.0751	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Radium-228	0.364		0.214	0.217		0.0819	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thallium-208	0.138		0.0659	0.0675		0.0342	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thorium 228	0.293		0.0852	0.0933		0.0455	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thorium-232	0.364		0.214	0.217		0.0819	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Thorium-234	0.176	U	0.265	0.266		0.672	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Uranium-235	0.116	U	0.222	0.222		0.176	pCi/g	12/04/20 14:01	12/25/20 09:29	1
Uranium-238	0.176	U	0.265	0.266		0.672	pCi/g	12/04/20 14:01	12/25/20 09:29	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-022

Lab Sample ID: 160-40596-22

Date Collected: 11/24/20 15:53

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.304		0.115	0.119		0.0236	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Actinium-227	-0.298	U	0.469	0.471		0.360	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Bismuth-212	-0.234	U	0.368	0.369		0.530	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Bismuth-214	0.0537	U	0.157	0.157		0.130	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Cesium-137	0.00948	U	0.0482	0.0482	0.0700	0.0269	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Lead-210	1.03		1.07	1.07		0.677	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Lead-212	0.306		0.0720	0.0821		0.0366	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Lead-214	0.327		0.0852	0.0917		0.0347	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Potassium-40	6.35		1.05	1.24		0.255	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Protactinium-231	0.000	U	0.259	0.259		1.89	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Protactinium-234	-0.0135	U	0.0257	0.0257		0.137	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Radium-226	0.0537	U	0.157	0.157	0.200	0.130	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Radium-228	0.304		0.115	0.119		0.0236	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Thallium-208	0.124		0.0484	0.0501		0.0201	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Thorium 228	0.306		0.0720	0.0821		0.0366	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Thorium-232	0.304		0.115	0.119		0.0236	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Thorium-234	-0.532	U	0.801	0.803		0.642	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Uranium-235	0.000	U	0.185	0.185		0.227	pCi/g	12/04/20 14:01	12/25/20 09:48	1
Uranium-238	-0.532	U	0.801	0.803		0.642	pCi/g	12/04/20 14:01	12/25/20 09:48	1

Client Sample ID: HPPG-ESU-TU107B-023

Lab Sample ID: 160-40596-23

Date Collected: 11/24/20 15:55

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.232		0.151	0.153		0.0785	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Actinium-227	0.185	U	0.371	0.372		0.212	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Bismuth-212	-0.0262	U	0.494	0.494		0.323	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Bismuth-214	0.293		0.0986	0.103		0.0424	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Cesium-137	0.0125	U	0.0301	0.0301	0.0700	0.0231	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Lead-210	0.359	U	0.931	0.932		0.746	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Lead-212	0.312		0.0598	0.0721		0.0232	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Lead-214	0.268		0.0726	0.0778		0.0413	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Potassium-40	6.54		0.990	1.19		0.227	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Protactinium-231	-0.0000001	U	1.84	1.84		1.52	pCi/g	12/04/20 14:01	12/25/20 09:47	1
	68									
Protactinium-234	0.0572	U	0.172	0.173		0.140	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Radium-226	0.293		0.0986	0.103	0.200	0.0424	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Radium-228	0.232		0.151	0.153		0.0785	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Thallium-208	0.0793		0.0444	0.0452		0.0209	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Thorium 228	0.312		0.0598	0.0721		0.0232	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Thorium-232	0.232		0.151	0.153		0.0785	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Thorium-234	-0.230	U	0.726	0.726		0.592	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Uranium-235	-0.125	U	0.212	0.212		0.168	pCi/g	12/04/20 14:01	12/25/20 09:47	1
Uranium-238	-0.230	U	0.726	0.726		0.592	pCi/g	12/04/20 14:01	12/25/20 09:47	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-ESU-TU107B-024

Lab Sample ID: 160-40596-24

Date Collected: 11/24/20 15:57

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.466		0.159	0.166		0.0601	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Actinium-227	0.0403	U	0.112	0.112		0.287	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Bismuth-212	-0.527	U	0.864	0.866		0.673	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Bismuth-214	0.307		0.108	0.112		0.0477	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Cesium-137	0.0187	U	0.0440	0.0440	0.0700	0.0340	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Lead-210	0.591	U	1.04	1.04		0.747	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Lead-212	0.287		0.0753	0.0810		0.0396	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Lead-214	0.298		0.101	0.106		0.0460	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Potassium-40	7.51		1.16	1.38		0.104	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Protactinium-231	0.0000000	U	2.22	2.22		1.83	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Protactinium-234	-0.0923	U	0.280	0.280		0.228	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Radium-226	0.307		0.108	0.112	0.200	0.0477	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Radium-228	0.466		0.159	0.166		0.0601	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Thallium-208	0.102		0.0455	0.0467		0.0159	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Thorium 228	0.287		0.0753	0.0810		0.0396	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Thorium-232	0.466		0.159	0.166		0.0601	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Thorium-234	0.524		0.579	0.582		0.380	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Uranium-235	0.0631	U	0.199	0.199		0.420	pCi/g	12/04/20 14:01	12/25/20 09:49	1
Uranium-238	0.524		0.579	0.582		0.380	pCi/g	12/04/20 14:01	12/25/20 09:49	1

Client Sample ID: HPPG-ESU-TU107B-025

Lab Sample ID: 160-40596-25

Date Collected: 11/24/20 16:01

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.318		0.221	0.224		0.103	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Actinium-227	-0.0869	U	0.499	0.499		0.294	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Bismuth-212	0.228	U	0.390	0.391		0.292	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Bismuth-214	0.355		0.108	0.114		0.0460	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Cesium-137	-0.0149	U	0.0539	0.0539	0.0700	0.0433	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Lead-210	-0.651	U	1.41	1.41		1.13	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Lead-212	0.423		0.0719	0.0904		0.0305	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Lead-214	0.251		0.0733	0.0778		0.0437	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Potassium-40	7.53		1.02	1.28		0.0812	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Protactinium-231	-0.689	U	2.11	2.11		1.71	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Protactinium-234	0.0309	U	0.214	0.214		0.175	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Radium-226	0.355		0.108	0.114	0.200	0.0460	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Radium-228	0.318		0.221	0.224		0.103	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thallium-208	0.130		0.0408	0.0430		0.0142	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thorium 228	0.423		0.0719	0.0904		0.0305	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thorium-232	0.318		0.221	0.224		0.103	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thorium-234	0.0243	U	0.0472	0.0473		0.783	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Uranium-235	0.000	U	0.159	0.159		0.300	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Uranium-238	0.0243	U	0.0472	0.0473		0.783	pCi/g	12/04/20 14:01	12/25/20 09:51	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Client Sample ID: HPPG-F-049

Lab Sample ID: 160-40596-26

Date Collected: 11/24/20 15:26

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.431		0.246	0.250		0.103	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Actinium-227	0.136	U	0.325	0.325		0.258	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Bismuth-212	-0.0307	U	0.823	0.823		0.675	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Bismuth-214	0.292		0.129	0.132		0.0594	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Cesium-137	0.0138	U	0.0656	0.0657	0.0700	0.0528	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Lead-210	1.01		1.31	1.31		0.887	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Lead-212	0.479		0.0879	0.101		0.0376	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Lead-214	0.518		0.104	0.117		0.0403	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Potassium-40	8.96		1.49	1.74		0.205	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Protactinium-231	-0.284	U	2.60	2.60		2.13	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Protactinium-234	0.0391	U	0.0736	0.0737		0.207	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Radium-226	0.292		0.129	0.132	0.200	0.0594	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Radium-228	0.431		0.246	0.250		0.103	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Thallium-208	0.172		0.0561	0.0588		0.0144	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Thorium 228	0.479		0.0879	0.101		0.0376	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Thorium-232	0.431		0.246	0.250		0.103	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Thorium-234	0.701		0.548	0.553		0.350	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Uranium-235	0.0652	U	0.145	0.145		0.360	pCi/g	12/04/20 14:01	12/25/20 10:16	1
Uranium-238	0.701		0.548	0.553		0.350	pCi/g	12/04/20 14:01	12/25/20 10:16	1

Client Sample ID: HPPG-F-050

Lab Sample ID: 160-40596-27

Date Collected: 11/24/20 15:44

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.159		0.0960	0.0974		0.0360	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Actinium-227	0.102	U	0.352	0.352		0.262	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Bismuth-212	0.239	U	0.626	0.627		0.483	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Bismuth-214	0.282		0.114	0.118		0.0632	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Cesium-137	0.00322	U	0.0552	0.0552	0.0700	0.0341	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Lead-210	0.810		0.863	0.868		0.580	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Lead-212	0.306		0.0768	0.0864		0.0341	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Lead-214	0.137		0.0928	0.0939		0.0875	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Potassium-40	6.82		1.34	1.51		0.245	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Protactinium-231	0.594	U	1.88	1.88		1.51	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Protactinium-234	0.0196	U	0.0506	0.0506		0.163	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Radium-226	0.282		0.114	0.118	0.200	0.0632	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Radium-228	0.159		0.0960	0.0974		0.0360	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Thallium-208	0.124		0.0569	0.0583		0.0210	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Thorium 228	0.306		0.0768	0.0864		0.0341	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Thorium-232	0.159		0.0960	0.0974		0.0360	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Thorium-234	0.455		0.425	0.428		0.287	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Uranium-235	-0.0659	U	0.0576	0.0579		0.172	pCi/g	12/04/20 14:01	12/25/20 10:15	1
Uranium-238	0.455		0.425	0.428		0.287	pCi/g	12/04/20 14:01	12/25/20 10:15	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Method: 905 - Strontium-90 (GFPC)

Lab Sample ID: MB 160-491323/23-A
Matrix: Solid
Analysis Batch: 492430

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491323

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	0.07392	U	0.140	0.140	0.331	0.108	pCi/g	12/09/20 18:42	12/18/20 20:20	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	100		40 - 110					12/09/20 18:42	12/18/20 20:20	1
Y Carrier	92.7		40 - 110					12/09/20 18:42	12/18/20 20:20	1

Lab Sample ID: LCS 160-491323/1-A
Matrix: Solid
Analysis Batch: 492430

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491323

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Strontium-90	7.76	5.897		0.638	0.331	0.109	pCi/g	76	75 - 125
Carrier	%Yield	Qualifier	Limits						
Sr Carrier	100		40 - 110						
Y Carrier	99.8		40 - 110						

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-491944/1-A
Matrix: Solid
Analysis Batch: 493574

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491944

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	-0.03528	U	0.0205	0.0207	0.250	0.0163	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	-0.06446	U	0.0317	0.0321	0.250	0.0228	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	-0.003259	U	0.00917	0.00917	0.250	0.00754	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	93.0		30 - 110					12/15/20 14:37	12/30/20 10:45	1

Lab Sample ID: LCS 160-491944/2-A
Matrix: Solid
Analysis Batch: 493575

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491944

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Thorium-230	2.01	1.989		0.213	0.250	0.0233	pCi/g	99	81 - 118
Tracer	%Yield	Qualifier	Limits						
Thorium-229	89.9		30 - 110						

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-490832/1-A
Matrix: Solid
Analysis Batch: 493377

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490832

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	-0.1405	U	0.389	0.389		0.204	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Actinium-227	0.1060	U	0.233	0.233		0.213	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Bismuth-212	-0.9069	U	1.30	1.31		1.31	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Bismuth-214	-0.1124	U	0.195	0.195		0.169	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Cesium-137	0.02373	U	0.106	0.106	0.0700	0.0844	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Lead-210	0.8434		1.17	1.17		0.768	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Lead-212	-0.001594	U	0.103	0.103		0.0849	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Lead-214	-0.1533	U	0.189	0.190		0.137	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Potassium-40	0.6779		0.685	0.689		0.372	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Protactinium-231	-0.8332	U	2.34	2.34		1.87	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Protactinium-234	0.05529	U	0.146	0.146		0.115	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Radium-226	-0.1124	U	0.195	0.195	0.200	0.169	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Radium-228	-0.1405	U	0.389	0.389		0.204	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thallium-208	0.005832	U	0.0140	0.0140		0.0330	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thorium 228	-0.001594	U	0.103	0.103		0.0849	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thorium-232	-0.1405	U	0.389	0.389		0.204	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thorium-234	-0.8414	U	0.454	0.464		0.723	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Uranium-235	0.08293	U	0.251	0.251		0.219	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Uranium-238	-0.8414	U	0.454	0.464		0.723	pCi/g	12/03/20 14:31	12/30/20 06:31	1

Lab Sample ID: LCS 160-490832/2-A
Matrix: Solid
Analysis Batch: 493376

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490832

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Americium-241	96.4	97.62		12.6		0.547	pCi/g	101	87 - 116
Cesium-137	26.7	29.90		3.56	0.0700	0.148	pCi/g	112	87 - 120
Cobalt-60	9.41	10.34		1.24		0.0533	pCi/g	110	87 - 115

Lab Sample ID: 160-40596-18 DU
Matrix: Solid
Analysis Batch: 493373

Client Sample ID: HPPG-ESU-TU107B-018
Prep Type: Total/NA
Prep Batch: 490832

Analyte	Sample	Sample	DU	DU	Total	LOQ	DLC	Unit	RER	RER Limit
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					
Actinium 228	0.171		0.3435		0.142		0.0302	pCi/g	0.45	1
Actinium-227	0.139	U	0.08717	U	0.173		0.306	pCi/g	0.08	1
Bismuth-212	0.221	U	0.0000	U	0.323		0.544	pCi/g	0.29	1
Bismuth-214	0.362		0.3645		0.110		0.0381	pCi/g	0.01	1
Cesium-137	0.0176	U	0.02481	U	0.0625	0.0700	0.0493	pCi/g	0.07	1
Lead-210	1.13		-0.07716	U	1.25		1.03	pCi/g	0.46	1
Lead-212	0.294		0.2842		0.0902		0.0483	pCi/g	0.05	1
Lead-214	0.319		0.3183		0.112		0.0449	pCi/g	0	1
Potassium-40	5.24		5.476		1.60		0.551	pCi/g	0.07	1
Protactinium-231	0.413	U	0.0000	U	0.418		1.69	pCi/g	0.20	1
Protactinium-234	-0.0377	U	-0.00795	U	0.0162		0.198	pCi/g	0.29	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-40596-18 DU
Matrix: Solid
Analysis Batch: 493373

Client Sample ID: HPPG-ESU-TU107B-018
Prep Type: Total/NA
Prep Batch: 490832

Analyte	Sample	Sample	DU	DU	Total	LOQ	DLC	Unit	RER	RER	Limit
	Result	Qual	Result	Qual	Uncert. (2σ+/-)						
Radium-226	0.362		0.3645		0.110	0.200	0.0381	pCi/g	0.01		1
Radium-228	0.171		0.3435		0.142		0.0302	pCi/g	0.45		1
Thallium-208	0.0950		0.04963		0.0839		0.0366	pCi/g	0.29		1
Thorium 228	0.294		0.2842		0.0902		0.0483	pCi/g	0.05		1
Thorium-232	0.171		0.3435		0.142		0.0302	pCi/g	0.45		1
Thorium-234	0.471		-0.05259	U	0.769		0.633	pCi/g	0.39		1
Uranium-235	0.194	U	0.1677	U	0.301		0.307	pCi/g	0.05		1
Uranium-238	0.471		-0.05259	U	0.769		0.633	pCi/g	0.39		1

Lab Sample ID: MB 160-490932/1-A
Matrix: Solid
Analysis Batch: 493019

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490932

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Actinium-227	0.2114	U	0.369	0.370		0.252	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-212	-0.5716	U	0.701	0.704		0.748	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-214	0.1200		0.0849	0.0858		0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Cesium-137	0.01945	U	0.0528	0.0528	0.0700	0.0284	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-210	-1.091	U	1.58	1.59		1.35	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-212	0.05856		0.0656	0.0660		0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-214	-0.004878	U	0.0790	0.0790		0.0648	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Potassium-40	-0.3926	U	1.05	1.05		0.608	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-231	-0.7658	U	2.88	2.88		2.34	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-234	0.1086		0.163	0.164		0.0693	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-226	0.1200		0.0849	0.0858	0.200	0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-228	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thallium-208	0.006909	U	0.0135	0.0135		0.0442	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium 228	0.05856		0.0656	0.0660		0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-232	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-234	-0.7448	U	0.597	0.603		0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-235	0.07022	U	0.183	0.183		0.144	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-238	-0.7448	U	0.597	0.603		0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1

Lab Sample ID: LCS 160-490932/2-A
Matrix: Solid
Analysis Batch: 493020

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490932

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Americium-241	96.4	96.82		10.2		0.624	pCi/g	100	87 - 116
Cesium-137	26.7	26.82		2.90	0.0700	0.119	pCi/g	100	87 - 120
Cobalt-60	9.43	9.590		1.04		0.0186	pCi/g	102	87 - 115

QC Association Summary

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Rad

Leach Batch: 490616

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-1	HPPG-ESU-TU107B-001	Total/NA	Solid	Dry and Grind	
160-40596-2	HPPG-ESU-TU107B-002	Total/NA	Solid	Dry and Grind	
160-40596-3	HPPG-ESU-TU107B-003	Total/NA	Solid	Dry and Grind	

Leach Batch: 490623

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-4	HPPG-ESU-TU107B-004	Total/NA	Solid	Dry and Grind	
160-40596-5	HPPG-ESU-TU107B-005	Total/NA	Solid	Dry and Grind	
160-40596-6	HPPG-ESU-TU107B-006	Total/NA	Solid	Dry and Grind	
160-40596-7	HPPG-ESU-TU107B-007	Total/NA	Solid	Dry and Grind	
160-40596-8	HPPG-ESU-TU107B-008	Total/NA	Solid	Dry and Grind	
160-40596-9	HPPG-ESU-TU107B-009	Total/NA	Solid	Dry and Grind	
160-40596-10	HPPG-ESU-TU107B-010	Total/NA	Solid	Dry and Grind	
160-40596-11	HPPG-ESU-TU107B-011	Total/NA	Solid	Dry and Grind	
160-40596-12	HPPG-ESU-TU107B-012	Total/NA	Solid	Dry and Grind	
160-40596-13	HPPG-ESU-TU107B-013	Total/NA	Solid	Dry and Grind	
160-40596-14	HPPG-ESU-TU107B-014	Total/NA	Solid	Dry and Grind	
160-40596-15	HPPG-ESU-TU107B-015	Total/NA	Solid	Dry and Grind	
160-40596-16	HPPG-ESU-TU107B-016	Total/NA	Solid	Dry and Grind	
160-40596-17	HPPG-ESU-TU107B-017	Total/NA	Solid	Dry and Grind	
160-40596-18	HPPG-ESU-TU107B-018	Total/NA	Solid	Dry and Grind	
160-40596-19	HPPG-ESU-TU107B-019	Total/NA	Solid	Dry and Grind	
160-40596-20	HPPG-ESU-TU107B-020	Total/NA	Solid	Dry and Grind	
160-40596-21	HPPG-ESU-TU107B-021	Total/NA	Solid	Dry and Grind	
160-40596-22	HPPG-ESU-TU107B-022	Total/NA	Solid	Dry and Grind	
160-40596-23	HPPG-ESU-TU107B-023	Total/NA	Solid	Dry and Grind	
160-40596-24	HPPG-ESU-TU107B-024	Total/NA	Solid	Dry and Grind	
160-40596-25	HPPG-ESU-TU107B-025	Total/NA	Solid	Dry and Grind	
160-40596-26	HPPG-F-049	Total/NA	Solid	Dry and Grind	
160-40596-27	HPPG-F-050	Total/NA	Solid	Dry and Grind	
160-40596-18 DU	HPPG-ESU-TU107B-018	Total/NA	Solid	Dry and Grind	

Prep Batch: 490832

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-1	HPPG-ESU-TU107B-001	Total/NA	Solid	Fill_Geo-21	490616
160-40596-2	HPPG-ESU-TU107B-002	Total/NA	Solid	Fill_Geo-21	490616
160-40596-3	HPPG-ESU-TU107B-003	Total/NA	Solid	Fill_Geo-21	490616
160-40596-4	HPPG-ESU-TU107B-004	Total/NA	Solid	Fill_Geo-21	490623
160-40596-5	HPPG-ESU-TU107B-005	Total/NA	Solid	Fill_Geo-21	490623
160-40596-6	HPPG-ESU-TU107B-006	Total/NA	Solid	Fill_Geo-21	490623
160-40596-7	HPPG-ESU-TU107B-007	Total/NA	Solid	Fill_Geo-21	490623
160-40596-8	HPPG-ESU-TU107B-008	Total/NA	Solid	Fill_Geo-21	490623
160-40596-9	HPPG-ESU-TU107B-009	Total/NA	Solid	Fill_Geo-21	490623
160-40596-10	HPPG-ESU-TU107B-010	Total/NA	Solid	Fill_Geo-21	490623
160-40596-11	HPPG-ESU-TU107B-011	Total/NA	Solid	Fill_Geo-21	490623
160-40596-12	HPPG-ESU-TU107B-012	Total/NA	Solid	Fill_Geo-21	490623
160-40596-13	HPPG-ESU-TU107B-013	Total/NA	Solid	Fill_Geo-21	490623
160-40596-14	HPPG-ESU-TU107B-014	Total/NA	Solid	Fill_Geo-21	490623
160-40596-15	HPPG-ESU-TU107B-015	Total/NA	Solid	Fill_Geo-21	490623
160-40596-16	HPPG-ESU-TU107B-016	Total/NA	Solid	Fill_Geo-21	490623
160-40596-17	HPPG-ESU-TU107B-017	Total/NA	Solid	Fill_Geo-21	490623

QC Association Summary

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
 SDG: GJ46599740

Rad (Continued)

Prep Batch: 490832 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-18	HPPG-ESU-TU107B-018	Total/NA	Solid	Fill_Geo-21	490623
MB 160-490832/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490832/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40596-18 DU	HPPG-ESU-TU107B-018	Total/NA	Solid	Fill_Geo-21	490623

Prep Batch: 490932

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-19	HPPG-ESU-TU107B-019	Total/NA	Solid	Fill_Geo-21	490623
160-40596-20	HPPG-ESU-TU107B-020	Total/NA	Solid	Fill_Geo-21	490623
160-40596-21	HPPG-ESU-TU107B-021	Total/NA	Solid	Fill_Geo-21	490623
160-40596-22	HPPG-ESU-TU107B-022	Total/NA	Solid	Fill_Geo-21	490623
160-40596-23	HPPG-ESU-TU107B-023	Total/NA	Solid	Fill_Geo-21	490623
160-40596-24	HPPG-ESU-TU107B-024	Total/NA	Solid	Fill_Geo-21	490623
160-40596-25	HPPG-ESU-TU107B-025	Total/NA	Solid	Fill_Geo-21	490623
160-40596-26	HPPG-F-049	Total/NA	Solid	Fill_Geo-21	490623
160-40596-27	HPPG-F-050	Total/NA	Solid	Fill_Geo-21	490623
MB 160-490932/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490932/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 491323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-1	HPPG-ESU-TU107B-001	Total/NA	Solid	DPS-7	490616
160-40596-11	HPPG-ESU-TU107B-011	Total/NA	Solid	DPS-7	490623
160-40596-21	HPPG-ESU-TU107B-021	Total/NA	Solid	DPS-7	490623
MB 160-491323/23-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-491323/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	

Prep Batch: 491944

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40596-1	HPPG-ESU-TU107B-001	Total/NA	Solid	ExtChrom	490616
160-40596-11	HPPG-ESU-TU107B-011	Total/NA	Solid	ExtChrom	490623
160-40596-21	HPPG-ESU-TU107B-021	Total/NA	Solid	ExtChrom	490623
MB 160-491944/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491944/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	

Tracer/Carrier Summary

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40596-1
SDG: GJ46599740

Method: 905 - Strontium-90 (GFPC)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Sr (40-110)	Y (40-110)
160-40596-1	HPPG-ESU-TU107B-001	97.1	96.8
160-40596-11	HPPG-ESU-TU107B-011	97.1	95.7
160-40596-21	HPPG-ESU-TU107B-021	96.7	91.2
LCS 160-491323/1-A	Lab Control Sample	100	99.8
MB 160-491323/23-A	Method Blank	100	92.7

Tracer/Carrier Legend

Sr = Sr Carrier

Y = Y Carrier

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)
		Th-229 (30-110)
160-40596-1	HPPG-ESU-TU107B-001	70.1
160-40596-11	HPPG-ESU-TU107B-011	78.8
160-40596-21	HPPG-ESU-TU107B-021	80.6
LCS 160-491944/2-A	Lab Control Sample	89.9
MB 160-491944/1-A	Method Blank	93.0

Tracer/Carrier Legend

Th-229 = Thorium-229



Environment Testing
America

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40598-1
Laboratory Sample Delivery Group: D1189454
Client Project/Site: HPNS-Parcel G 501197
Revision: 2

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/14/2021 3:02:56 PM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@Eurofinset.com

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www.eurofinsus.com/Env

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Case Narrative

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
SDG: D1189454

Job ID: 160-40598-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40598-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Updated isotopic thorium to report DLC.

Revision 2- Additional information requested in case narrative for total strontium

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
SDG: D1189454

Job ID: 160-40598-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT

The samples were received on 11/27/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 15.6 C.

STRONTIUM-90 (GFPC)

Sample HPPG-ESU-TU107B-B-001 (160-40598-1) was analyzed for Strontium-90 (GFPC) in accordance with EPA 905. The samples were dried on 12/02/2020, prepared on 12/09/2020 and analyzed on 12/18/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-ESU-TU107B-B-001 (160-40598-1).

The method blank (MB) z-score is within limits and is stored in the level IV raw data. (MB 160-491323/23-A)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Sample HPPG-ESU-TU107B-B-001 (160-40598-1) was analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with DOE A01R_Th. The samples were dried on 12/02/2020, prepared on 12/15/2020 and analyzed on 12/30/2020.

Isotopic Thorium Prep Batch 160-491944

A blank population correction was applied to account for contributions to the analyte count rate from sources other than the sample itself. Interferences may include, but are not limited to, impurities in reagents, tracers, or glassware, or effects due to the measurement process (such as tailing or crosstalk). HPPG-ESU-TU107B-B-001 (160-40598-1), (LCS 160-491944/2-A), (MB 160-491944/1-A), (160-40595-A-1-D) and (160-40595-A-1-E DU)

Results for the method blank (MB) are negative more than 3 times the 1 total propagated uncertainty (TPU). This appears to be random in nature, and does not affect the sample results. The magnitude of the negative results is minimal compared to the client sample results. The laboratory does not believe this excursion adversely affects the data. (MB 160-491944/1-A)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Sample HPPG-ESU-TU107B-B-001 (160-40598-1) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 12/02/2020, prepared on 12/04/2020 and analyzed on 12/25/2020.

Gamma prep batch 160-490932

The method blank (MB) z-score associated with Prep Batch 160-490932 is within limits and is stored in the level IV raw data. (MB 160-490932/1-A)

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from	Reported to Analyte
Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
SDG: D1189454

Job ID: 160-40598-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

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APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy

Sample Lead: Murri, Andrew

Sample Tech(s):

CHAIN OF CUSTODY

Ref. Document # 501197RSY-048

Project Number: 501197		Analysis Requested					Evidence Bag ID	Comment			
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action		Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma	Strontium-90 (EPA 905 MOD)	Isotopic Th(228, 230, 232)	Dose Rate uR/Hr						
Project Location: San Francisco, CA											
Purchase Order #: 1159058											
Shipment/Pickup Date: 11/25/2020											
Waybill Number: 4957 0225 6192											
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046											
Lab Contact Name/ph #: Rhoeda Ridenbower (314)298-8566											
Matrix	# of Containers	Preservatives (water)									
		Preservatives (soil)									
		Container Type									
Sample ID	Date	Time	Method								
HPPG-ESU-TU107B-B-001	11/25/2020	10:56	G	SO	1	16 oz. plastic jar	X	X	X	5	D1189454

Special Instructions: 21 day ingrowth results only

Turanaround Time: 3-day 10-Day 28-day Other **Level of QC Required:** I II III **Project Specific**

Method Codes C = Composite G = Grab **Matrix Codes:** DW = Drinking Water ; So = Soil; GW = Ground Water; SL = Sludge; WW = Waste Water; CP = Chip Samples; A = Air ; ABS = Asbestos; PO = Pipe Opening

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Murri, Andrew		11/25/2020 11:59	Devin Lewis		11/25/2020 11:59
Devin Lewis		11/25/2020 12:00	SHIPPEDTOLAB		11/27/2020 09:12

*** Last 3 transfers shown above - Complete list of transfers on last page ***

MICHA KORRINHIZER



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4/14/2021 (Rev. 2)



All Transfers for COC 501197RSY-048

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Murri, Andrew		11/25/2020 11:59	Devin Lewis		11/25/2020 11:59
Devin Lewis		11/25/2020 12:00	SHIPPEDTOLAB	 MICHA KORRINGHYZER	11/27/2020 09:12

MICHA KORRINGHYZER



Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40598-1

SDG Number: D1189454

Login Number: 40598**List Source: Eurofins TestAmerica, St. Louis****List Number: 1****Creator: Greer, Diane A**

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
SDG: D1189454

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
SDG: D1189454

Method	Method Description	Protocol	Laboratory
905	Strontium-90 (GFPC)	EPA	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-7	Preparation, Digestion/Precipitate Separation (7-Day In-Growth)	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

- DOE = U.S. Department of Energy
- EPA = US Environmental Protection Agency
- None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



Sample Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
SDG: D1189454

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40598-1	HPPG-ESU-TU107B-B-001	Solid	11/25/20 10:56	11/27/20 09:12	

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
 SDG: D1189454

Client Sample ID: HPPG-ESU-TU107B-B-001

Lab Sample ID: 160-40598-1

Date Collected: 11/25/20 10:56

Matrix: Solid

Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	-0.0106	U	0.142	0.142	0.331	0.117	pCi/g	12/09/20 18:42	12/18/20 20:16	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	98.7		40 - 110					12/09/20 18:42	12/18/20 20:16	1
Y Carrier	94.6		40 - 110					12/09/20 18:42	12/18/20 20:16	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.293		0.0594	0.0643	0.250	0.0213	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.243		0.0615	0.0648	0.250	0.0241	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.325		0.0546	0.0611	0.250	0.00954	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	80.8		30 - 110					12/15/20 14:37	12/30/20 10:45	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.233		0.160	0.162		0.106	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Actinium-227	0.157	U	0.337	0.337		0.302	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Bismuth-212	-0.350	U	0.888	0.889		0.700	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Bismuth-214	0.329		0.139	0.144		0.0627	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Cesium-137	-0.0251	U	0.0690	0.0691	0.0700	0.0545	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Lead-210	1.42		1.37	1.39		0.917	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Lead-212	0.347		0.0870	0.0961		0.0431	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Lead-214	0.392		0.118	0.126		0.0433	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Potassium-40	7.28		1.33	1.57		0.295	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Protactinium-231	-0.933	U	3.11	3.11		2.53	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Protactinium-234	0.00263	U	0.00476	0.00477		0.288	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Radium-226	0.329		0.139	0.144	0.200	0.0627	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Radium-228	0.233		0.160	0.162		0.106	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thallium-208	0.145		0.0586	0.0610		0.0231	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thorium 228	0.347		0.0870	0.0961		0.0431	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thorium-232	0.233		0.160	0.162		0.106	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Thorium-234	-0.824	U	0.766	0.773		0.604	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Uranium-235	0.184	U	0.489	0.489		0.532	pCi/g	12/04/20 14:01	12/25/20 09:51	1
Uranium-238	-0.824	U	0.766	0.773		0.604	pCi/g	12/04/20 14:01	12/25/20 09:51	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
 SDG: D1189454

Method: 905 - Strontium-90 (GFPC)

Lab Sample ID: MB 160-491323/23-A
Matrix: Solid
Analysis Batch: 492430

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491323

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	0.07392	U	0.140	0.140	0.331	0.108	pCi/g	12/09/20 18:42	12/18/20 20:20	1
Carrier	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Sr Carrier	100		40 - 110		12/09/20 18:42	12/18/20 20:20	1			
Y Carrier	92.7		40 - 110		12/09/20 18:42	12/18/20 20:20	1			

Lab Sample ID: LCS 160-491323/1-A
Matrix: Solid
Analysis Batch: 492430

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491323

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Strontium-90	7.76	5.897		0.638	0.331	0.109	pCi/g	76	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Sr Carrier	100		40 - 110						
Y Carrier	99.8		40 - 110						

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-491944/1-A
Matrix: Solid
Analysis Batch: 493574

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491944

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	-0.03528	U	0.0205	0.0207	0.250	0.0163	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	-0.06446	U	0.0317	0.0321	0.250	0.0228	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	-0.003259	U	0.00917	0.00917	0.250	0.00754	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Thorium-229	93.0		30 - 110		12/15/20 14:37	12/30/20 10:45	1			

Lab Sample ID: LCS 160-491944/2-A
Matrix: Solid
Analysis Batch: 493575

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491944

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Thorium-230	2.01	1.989		0.213	0.250	0.0233	pCi/g	99	81 - 118
Tracer	LCS %Yield	LCS Qualifier	Limits						
Thorium-229	89.9		30 - 110						

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
 SDG: D1189454

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-490932/1-A
Matrix: Solid
Analysis Batch: 493019

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490932

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Actinium-227	0.2114	U	0.369	0.370		0.252	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-212	-0.5716	U	0.701	0.704		0.748	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-214	0.1200		0.0849	0.0858		0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Cesium-137	0.01945	U	0.0528	0.0528	0.0700	0.0284	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-210	-1.091	U	1.58	1.59		1.35	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-212	0.05856		0.0656	0.0660		0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-214	-0.004878	U	0.0790	0.0790		0.0648	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Potassium-40	-0.3926	U	1.05	1.05		0.608	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-231	-0.7658	U	2.88	2.88		2.34	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-234	0.1086		0.163	0.164		0.0693	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-226	0.1200		0.0849	0.0858	0.200	0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-228	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thallium-208	0.006909	U	0.0135	0.0135		0.0442	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium 228	0.05856		0.0656	0.0660		0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-232	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-234	-0.7448	U	0.597	0.603		0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-235	0.07022	U	0.183	0.183		0.144	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-238	-0.7448	U	0.597	0.603		0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1

Lab Sample ID: LCS 160-490932/2-A
Matrix: Solid
Analysis Batch: 493020

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490932

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium-241	96.4	96.82		10.2		0.624	pCi/g	100	87 - 116
Cesium-137	26.7	26.82		2.90	0.0700	0.119	pCi/g	100	87 - 120
Cobalt-60	9.43	9.590		1.04		0.0186	pCi/g	102	87 - 115

Lab Sample ID: 160-40598-1 DU
Matrix: Solid
Analysis Batch: 493023

Client Sample ID: HPPG-ESU-TU107B-B-001
Prep Type: Total/NA
Prep Batch: 490932

Analyte	Sample Sample		DU DU		Total	LOQ	DLC	Unit	RER	RER
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					Limit
Actinium 228	0.233		0.4714		0.162		0.0455	pCi/g	0.74	1
Actinium-227	0.157	U	-0.04679	U	0.680		0.261	pCi/g	0.20	1
Bismuth-212	-0.350	U	-0.02624	U	0.610		0.436	pCi/g	0.22	1
Bismuth-214	0.329		0.2617		0.0898		0.0369	pCi/g	0.29	1
Cesium-137	-0.0251	U	0.02801	U	0.0491	0.0700	0.0381	pCi/g	0.45	1
Lead-210	1.42		-0.1530	U	0.923		0.751	pCi/g	0.68	1
Lead-212	0.347		0.2554		0.0698		0.0319	pCi/g	0.55	1
Lead-214	0.392		0.2673		0.0722		0.0294	pCi/g	0.63	1
Potassium-40	7.28		6.730		1.22		0.228	pCi/g	0.20	1
Protactinium-231	-0.933	U	-0.6318	U	1.96		1.59	pCi/g	0.06	1
Protactinium-234	0.00263	U	0.007675	U	0.0130		0.176	pCi/g	0.28	1
Radium-226	0.329		0.2617		0.0898	0.200	0.0369	pCi/g	0.29	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
 SDG: D1189454

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-40598-1 DU
 Matrix: Solid
 Analysis Batch: 493023

Client Sample ID: HPPG-ESU-TU107B-B-001
 Prep Type: Total/NA
 Prep Batch: 490932

Analyte	Sample		DU		Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER Limit
	Result	Qual	Result	Qual						
Radium-228	0.233		0.4714		0.162		0.0455	pCi/g	0.74	1
Thallium-208	0.145		0.1016		0.0408		0.0161	pCi/g	0.43	1
Thorium 228	0.347		0.2554		0.0698		0.0319	pCi/g	0.55	1
Thorium-232	0.233		0.4714		0.162		0.0455	pCi/g	0.74	1
Thorium-234	-0.824	U	0.1947	U	0.735		0.600	pCi/g	0.68	1
Uranium-235	0.184	U	0.0000	U	0.136		0.320	pCi/g	0.29	1
Uranium-238	-0.824	U	0.1947	U	0.735		0.600	pCi/g	0.68	1



QC Association Summary

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
 SDG: D1189454

Rad

Leach Batch: 490770

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40598-1	HPPG-ESU-TU107B-B-001	Total/NA	Solid	Dry and Grind	
160-40598-1 DU	HPPG-ESU-TU107B-B-001	Total/NA	Solid	Dry and Grind	

Prep Batch: 490932

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40598-1	HPPG-ESU-TU107B-B-001	Total/NA	Solid	Fill_Geo-21	490770
MB 160-490932/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490932/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40598-1 DU	HPPG-ESU-TU107B-B-001	Total/NA	Solid	Fill_Geo-21	490770

Prep Batch: 491323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40598-1	HPPG-ESU-TU107B-B-001	Total/NA	Solid	DPS-7	490770
MB 160-491323/23-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-491323/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	

Prep Batch: 491944

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40598-1	HPPG-ESU-TU107B-B-001	Total/NA	Solid	ExtChrom	490770
MB 160-491944/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491944/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	

Tracer/Carrier Summary

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40598-1
SDG: D1189454

Method: 905 - Strontium-90 (GFPC)

Matrix: Solid

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Sr (40-110)	Y (40-110)
160-40598-1	HPPG-ESU-TU107B-B-001	98.7	94.6
LCS 160-491323/1-A	Lab Control Sample	100	99.8
MB 160-491323/23-A	Method Blank	100	92.7

Tracer/Carrier Legend
Sr = Sr Carrier
Y = Y Carrier

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Th-229 (30-110)
160-40598-1	HPPG-ESU-TU107B-B-001	80.8
LCS 160-491944/2-A	Lab Control Sample	89.9
MB 160-491944/1-A	Method Blank	93.0

Tracer/Carrier Legend
Th-229 = Thorium-229

Hunters Point Naval Shipyard, Parcel G, RSY Data Report

Contract No. N62473-17-D-006 CTO N6247318F5065 RSY Pad Data Report	
RSY Pad: RSY 38 Use 1	Soil Origin: TU-107A SFU
Data attached and submitted by: Amy Mangel	Data Report Submittal Date: 01/28/2021

Systematic Soil Sample Data: RSY 38 Use 1								
Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 NaI Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁹⁰ Sr Final Analytical Results (pCi/g)	²³² Th Final Analytical Results (pCi/g)
Project Remediation Goals*					1.861	0.141	0.331	1.69
HPPG-SFU-TU107A-001	1	Systematic	10,959	15,359	0.188	0.0396	-0.0190	0.612
HPPG-SFU-TU107A-002	2	Systematic	10,740	15,359	0.338	0.0146	N/A	N/A
HPPG-SFU-TU107A-003	3	Systematic	10,096	15,359	0.272	-0.0299	N/A	N/A
HPPG-SFU-TU107A-004	4	Systematic	10,179	15,359	0.196	-0.0499	N/A	N/A
HPPG-SFU-TU107A-005	5	Systematic	10,707	15,359	0.433	0.00941	N/A	N/A
HPPG-SFU-TU107A-006	6	Systematic	10,144	15,359	0.265	-0.0576	N/A	N/A
HPPG-SFU-TU107A-007	7	Systematic	10,791	15,359	0.304	0.00998	N/A	N/A
HPPG-SFU-TU107A-008	8	Systematic	9,928	15,359	0.348	-0.0319	N/A	N/A
HPPG-SFU-TU107A-009	9	Systematic	10,193	15,359	0.387	0.00263	N/A	N/A
HPPG-SFU-TU107A-010	10	Systematic	9,920	15,359	0.0352	0.00411	N/A	N/A
HPPG-SFU-TU107A-011	11	Systematic	11,336	15,359	0.532	0.0193	0.0769	0.391
HPPG-SFU-TU107A-012	12	Systematic	9,574	15,359	0.290	-0.0200	N/A	N/A
HPPG-SFU-TU107A-013	13	Systematic	10,252	15,359	0.103	-0.0325	N/A	N/A
HPPG-SFU-TU107A-014	14	Systematic	9,918	15,359	0.266	0.0103	N/A	N/A
HPPG-SFU-TU107A-015	15	Systematic	9,753	15,359	0.245	-0.0195	N/A	N/A
HPPG-SFU-TU107A-016	16	Systematic	10,159	15,359	0.176	-0.0118	N/A	N/A
HPPG-SFU-TU107A-017	17	Systematic	10,574	15,359	0.276	0.0149	N/A	N/A
HPPG-SFU-TU107A-018	18	Systematic	9,036	15,359	0.184	0.0124	N/A	N/A
HPPG-SFU-TU107A-019	19	Systematic	9,728	15,359	0.0432	0.00681	N/A	N/A
HPPG-SFU-TU107A-020	20	Systematic	9,990	15,359	0.0721	-0.00261	N/A	N/A
HPPG-SFU-TU107A-021	21	Systematic	10,365	15,359	0.198	-0.0284	0.0334	0.440
HPPG-SFU-TU107A-022	22	Systematic	9,502	15,359	0.284	-0.0151	N/A	N/A
HPPG-SFU-TU107A-023	23	Systematic	11,026	15,359	0.270	0.0134	N/A	N/A
HPPG-SFU-TU107A-024	24	Systematic	10,613	15,359	0.445	0.0228	N/A	N/A
HPPG-SFU-TU107A-025	25	Systematic	10,125	15,359	0.290	0.0280	N/A	N/A
Soil Systematic Sample Statistics					²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁹⁰ Sr Final Analytical Results (pCi/g)	²³² Th Final Analytical Results (pCi/g)
Maximum					0.532	0.0396	0.0769	0.612
Mean					0.2576	-0.0036	0.0304	0.481
Median					0.27	0.0041	0.0334	0.44
Minimum					0.0352	-0.0576	-0.019	0.391
Standard Deviation					0.1219	0.0248	N/A	N/A

Biased Soil Sample Data: RSY 38 Use 1								
Sample Identification	Sample Location	Type of Sample	Gamma Static 3x3 NaI Reading (CPM)	Gamma 3x3 Static Investigation Level (CPM)	²²⁶ Ra Final Analytical Results (pCi/g)	¹³⁷ Cs Final Analytical Results (pCi/g)	⁹⁰ Sr Final Analytical Results (pCi/g)	²³² Th Final Analytical Results (pCi/g)
Project Remediation Goals*					1.861	0.141	0.331	1.69
HPPG-SFU-TU107A-B-001	1	Biased	10,451	15,658	0.452	-0.0169	0.0249	0.343

CPM Counts per minute

pCi/g Picocuries per gram

* Note: Project Remediation goal (RG) is the Record of Decision RG or Offsite RBA value, whichever is higher

Instrument and Survey Summary					
Activity	Survey #	Date	Meter	Calibration Due Date	Serial #
Gamma Walkover Survey	HPRS-11232020-PG-ROV-335	11/23/2020	RS-700	03/31/2022	5447/5448
Follow-Up Static Survey	HPRS-11242020-PG-JSS-342	11/24/2020	RS-700	03/31/2022	5447/5448
Systematic Sample Survey	HPRS-11242020-PG-JSS-346	11/24/2020	3x3	10/09/2021	271420
Biased Sample Survey	HPRS-11252020-PG-JSS-349	11/25/2020	3x3	08/06/2021	108853

Region of Interest (ROI) Summary	
ROI	Nuclide and Energy
ROI 3	Ra-226 (1764 keV)
ROI 4	Th-232 (2614 keV)
ROI 6	Ra-226 (609 keV)
ROI 7	Cs-137 (662 keV)
ROI 8	Ra-226 (351 keV)
ROI 10	Gross Gamma

Summary: RSY 38 Use 1
<p>1) Gamma walkover survey and data review—upon review of initial RS-700 scan data in accordance with Final Parcel G Work Plan Section 3.5.1.1, 32 follow-up static investigations were required. Gamma scan data summary statistics, normal Q-Q plots, histograms, and box plots are provided on pages 3-6. Contour maps of the scan data for the ROIs of interest are presented on page 7. The RSY scan data was lower than the background scan data. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection. Note: This RSY pad was partially full, which is why there is a lower number of scan data points.</p>
<p>2) One-minute static follow-up measurements with the RS-700 were collected at 32 gamma walkover investigation locations in accordance with Final Parcel G Work Plan Section 3.3.1. A map of the follow-up locations is presented on page 9. The net follow-up static spectra are presented on pages 14-45. The exact same RS-700 and detectors were used for the background data collection and the RSY pad data collection.</p>
<p>3) In accordance with Final Parcel G Work Plan Section 3.4.1, twenty-five systematic soil samples (001-025) were obtained and submitted for gamma spectroscopy analysis. Sample locations are shown on the Systematic Sample Survey map (page 10). TestAmerica sample results are attached (pages 46-83). Ten percent of the systematic soil samples (three samples in total -001, -011, & -021) were also analyzed for ⁹⁰Sr and ²³²Th (via alpha spectroscopy). Strontium-90 and ²³²Th results are also included in the TestAmerica sample results reports (pages 46-83). Samples HPPG-F-047 and HPPG-F-048 are field duplicates, correlating to systematic samples -011 and -022. The Data Quality Assessment which will be included in the RACR will provide an analysis and discussion of field duplicates for the project. The Instrument and Survey Summary table above lists the 3x3 NaI detector used for the gamma static measurements collected during sampling activities, and the instrument-specific gamma static IL listed in the sample tables on page one is developed from that instrument's RBA data.</p> <p>Systematic sample histograms, box plots, Q-Q plots, and power curves are provided on pages 12-13. All sample results were below the applicable RGs. The number of samples collected was sufficient to meet project DQOs.</p>
<p>4) In accordance with Final Parcel G Work Plan Section 3.3.1 and 3.4.1, one biased sample was collected since all follow-up static measurements were below the ROC-specific critical levels. The biased sample was collected from the location of the highest gross gamma scan measurement. TestAmerica sample results are attached (pages 84-99). A map of the biased sample location is presented on page 11. Biased sample results were all below the applicable RGs.</p>
<p>Conclusions:</p> <p>In accordance with the DQOs in Section 3.1 of the Final Parcel G Work Plan, final analytical results for all samples from the RSY pad were shown by a point by point comparison to meet the RGs. Graphical comparisons demonstrated that ROC concentrations were consistent with background.</p> <p>RSY 38 Use 1 contains soil from Hunters Point Naval Shipyard Parcel G Phase 1 excavation TU-107A SFU.</p> <p>APTIM requests RASO concurrence to release this soil as Non-LLRW.</p> <p>Disposition: This soil shall be used as backfill for TU-107.</p>

Soil Scan Statistics

Statistical Summary

Dataset	PG-RSY-38-U1				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	2.00	28.05	11.95	12.02	3.52
ROI-04	2.00	28.06	12.01	12.02	3.71
ROI-06	51.12	125.27	83.91	83.18	10.96
ROI-07	39.09	96.21	65.42	65.15	9.21
ROI-08	66.15	151.34	105.28	105.22	12.46
ROI-10	1,717.47	2,468.86	2,122.29	2,127.35	123.33

Statistical Summary Reference Background

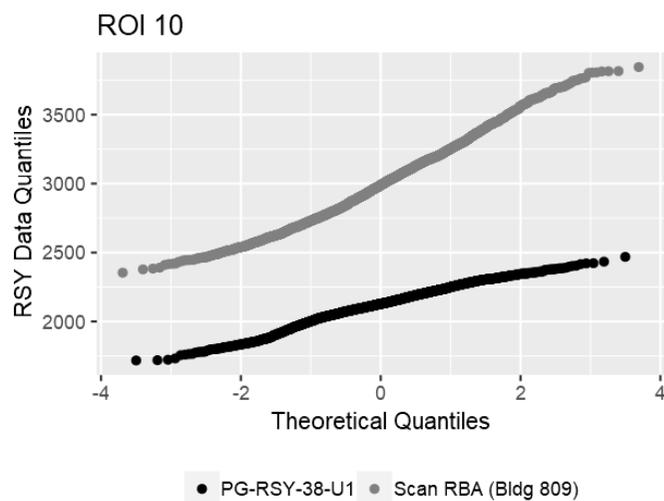
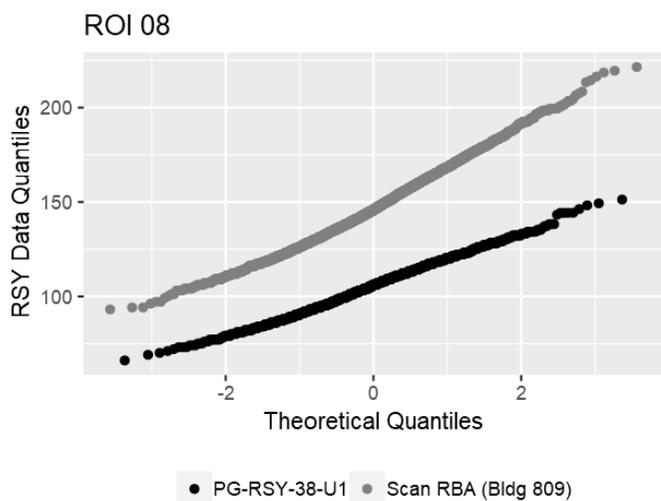
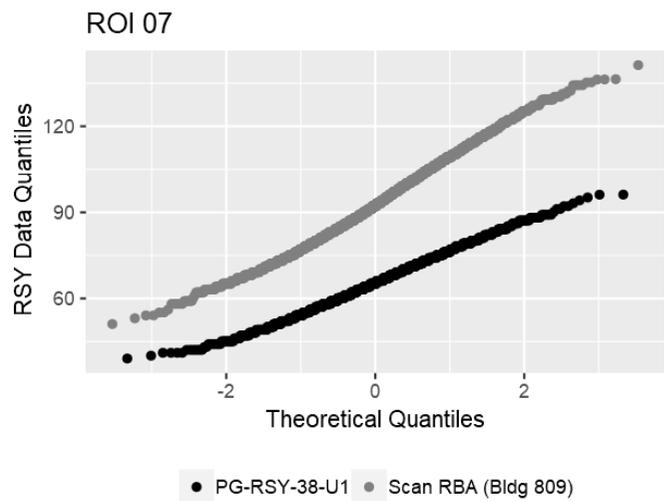
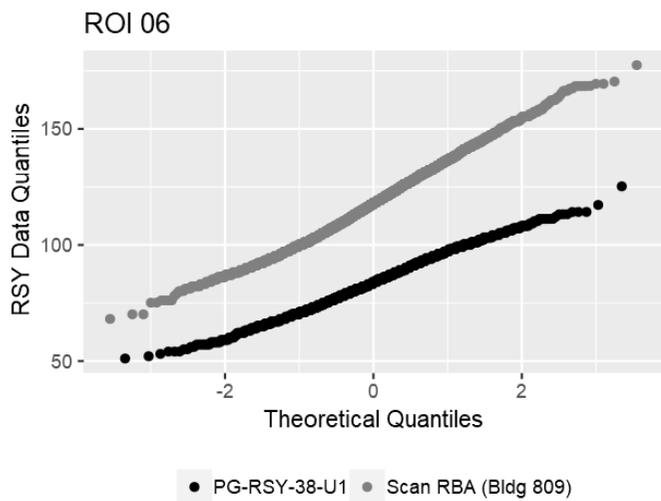
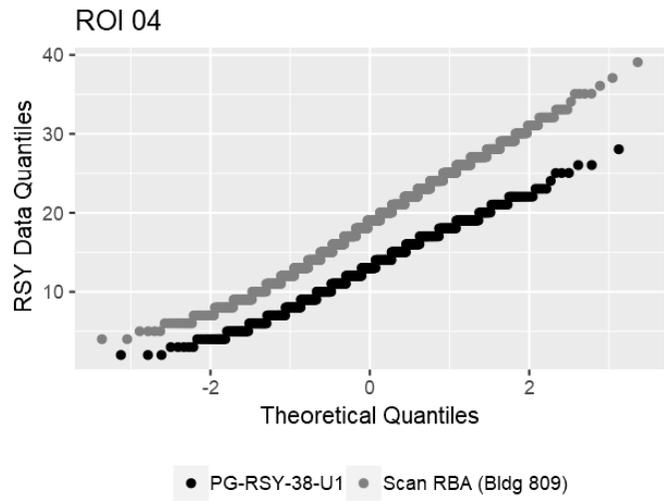
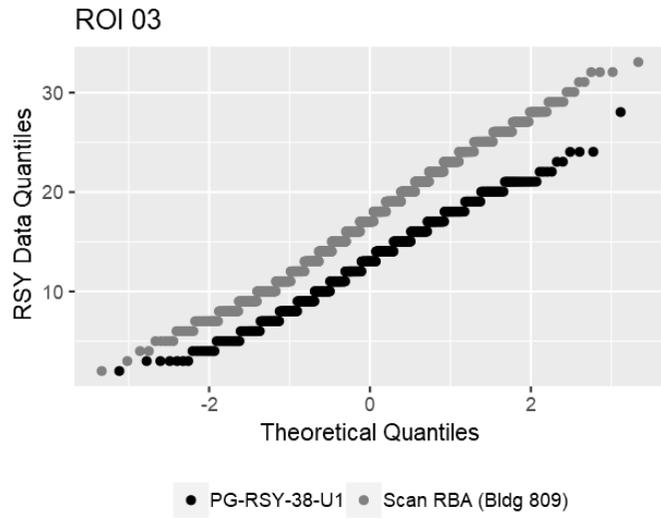
TYPE	Scan RBA (Bldg 809)				
ROI	Minimum (cps)	Maximum (cps)	Mean (cps)	Median (cps)	Standard Deviation (cps)
ROI-03	2.00	33.08	16.21	16.04	4.13
ROI-04	4.01	39.08	17.52	17.04	4.89
ROI-06	68.15	177.45	117.58	117.26	15.50
ROI-07	51.11	141.33	92.34	91.24	13.43
ROI-08	93.19	221.48	146.24	145.30	18.21
ROI-10	2,354.11	3,845.31	2,995.57	2,989.64	255.66

cps = counts per second

Dataset	Number of Data Points
PG-RSY-38-U1	2287
Scan RBA (Bldg 809)	4632

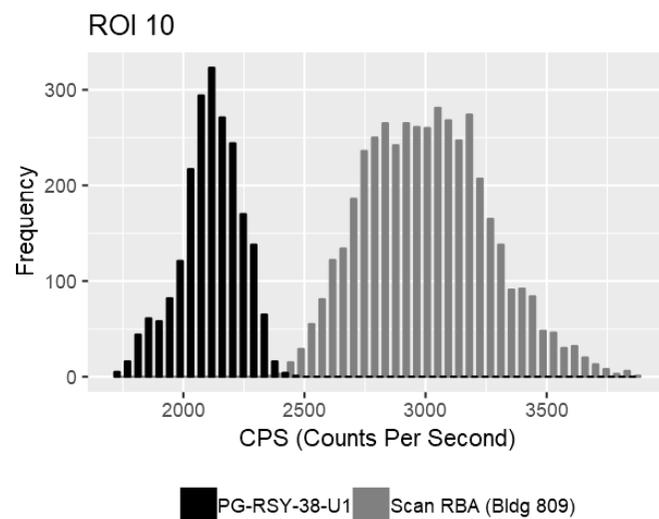
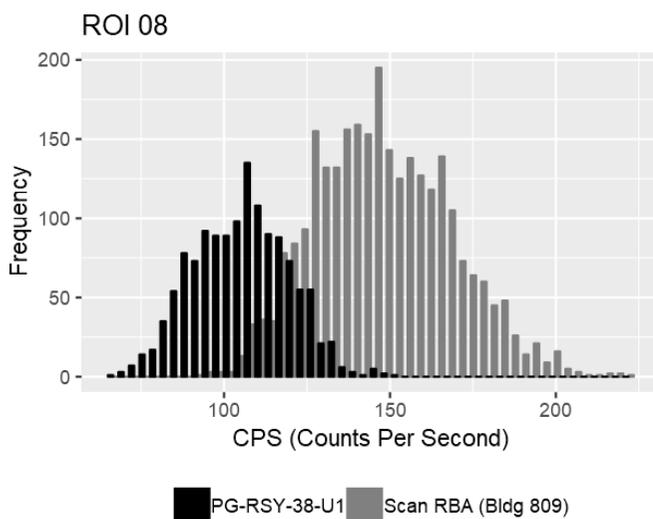
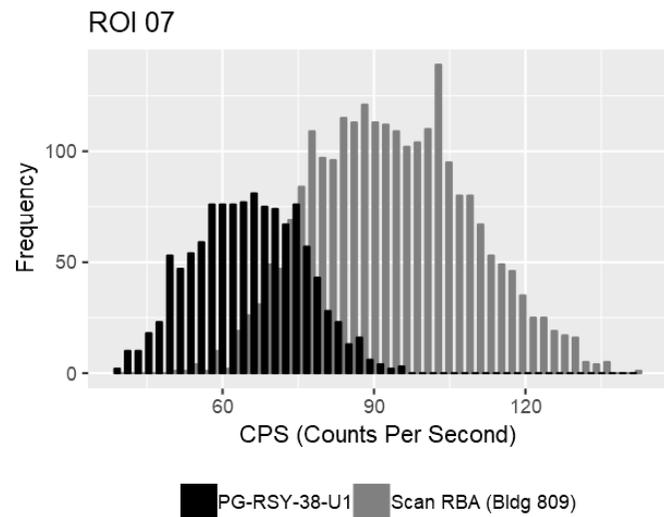
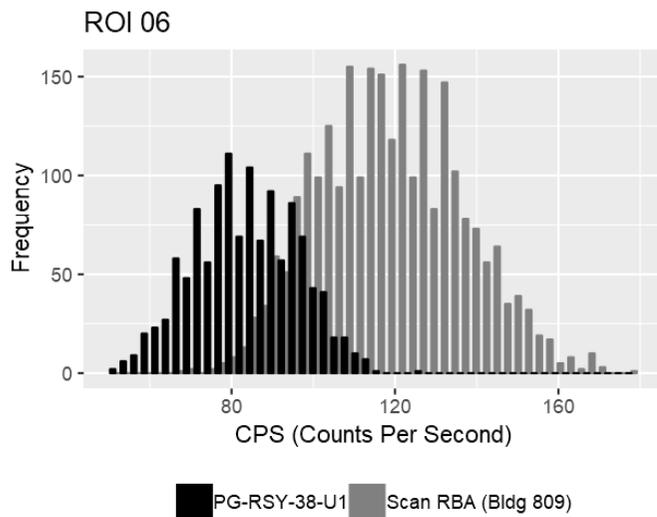
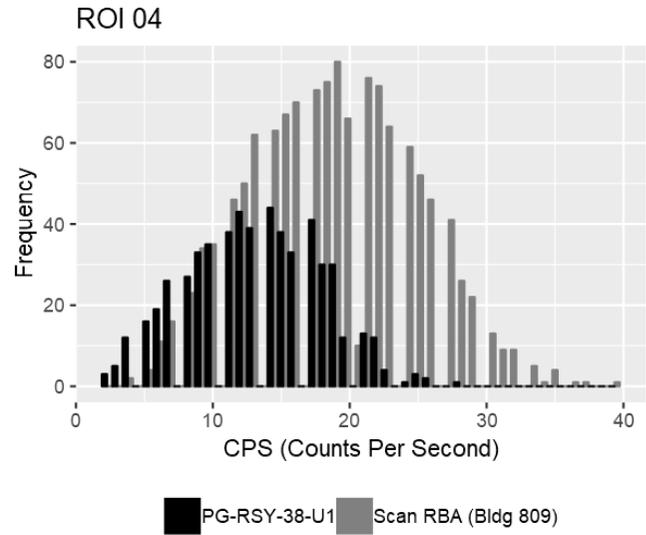
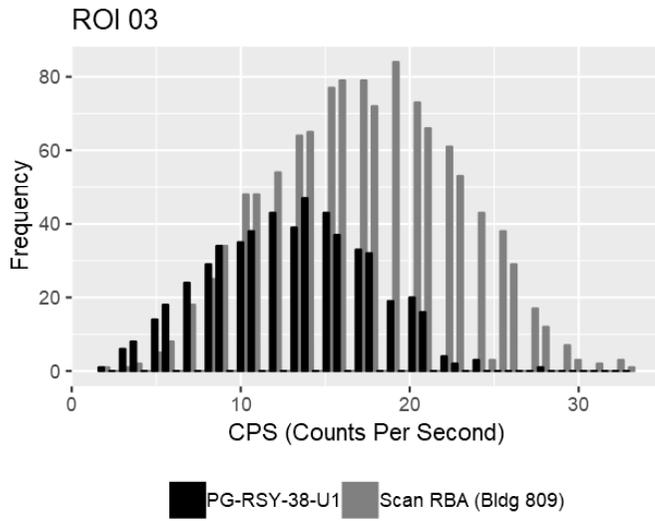
Soil Scan Statistics

Normal Q-Q Plots



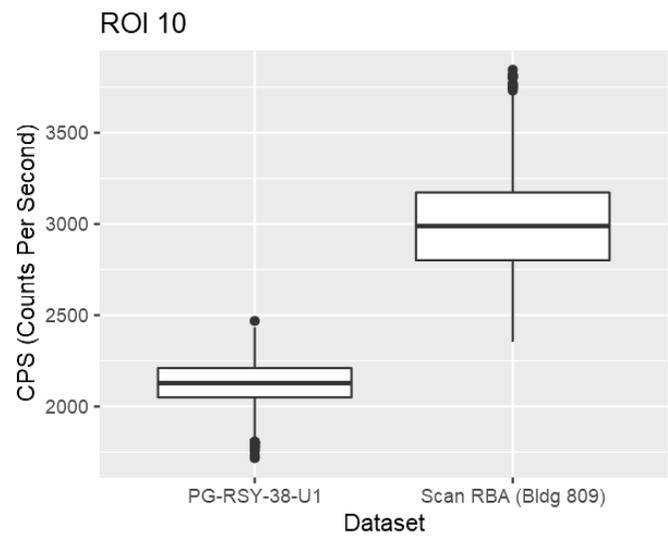
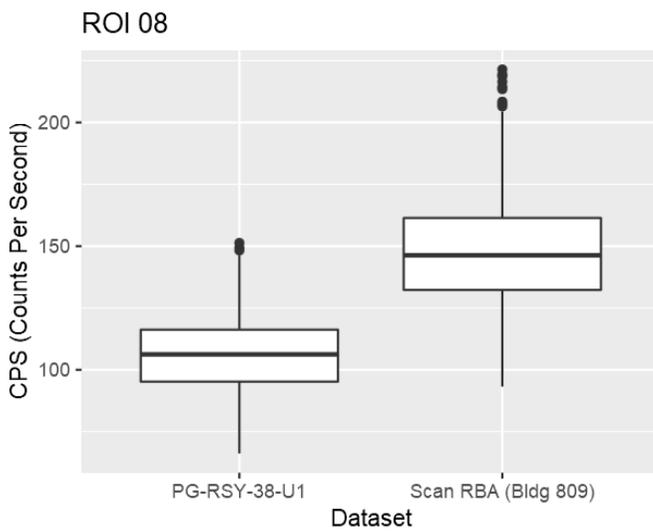
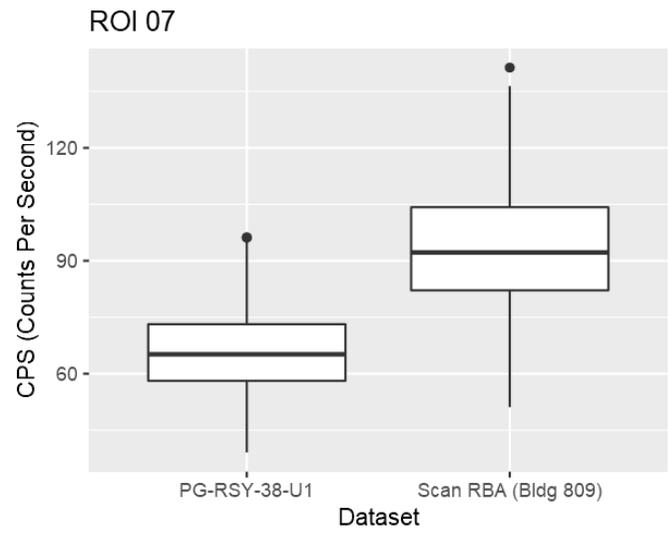
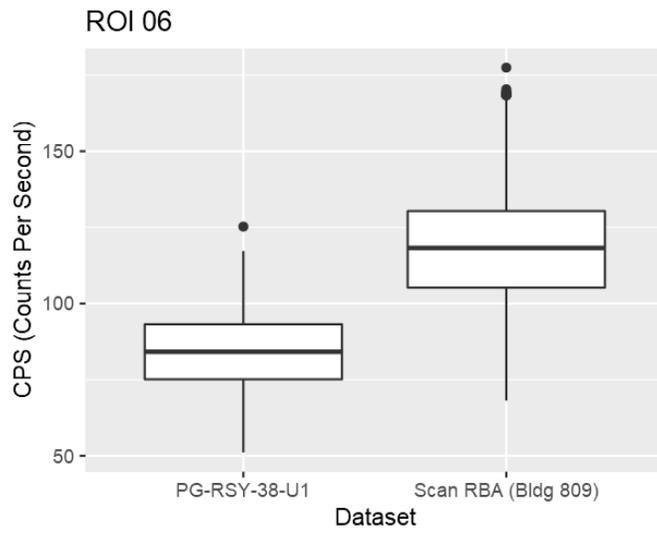
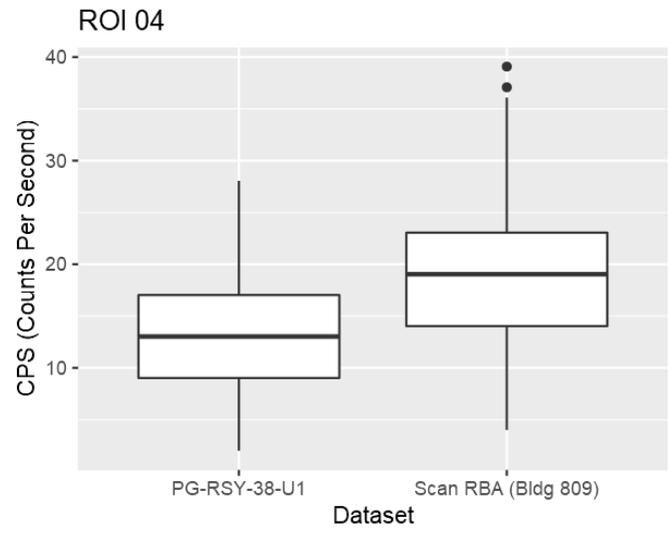
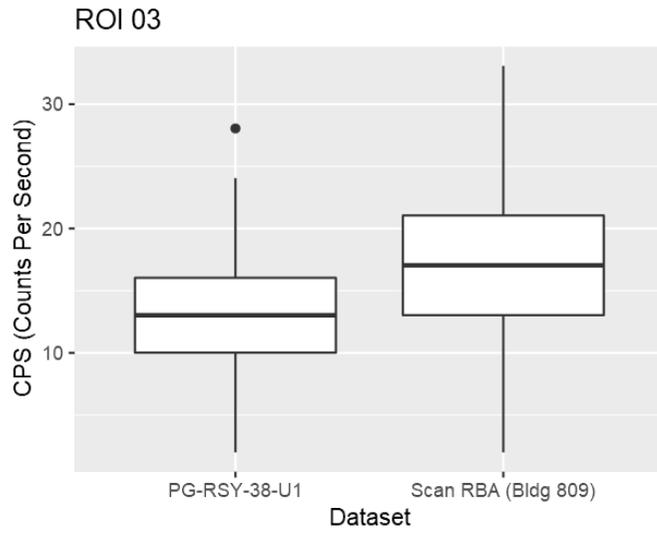
Soil Scan Statistics

Histograms



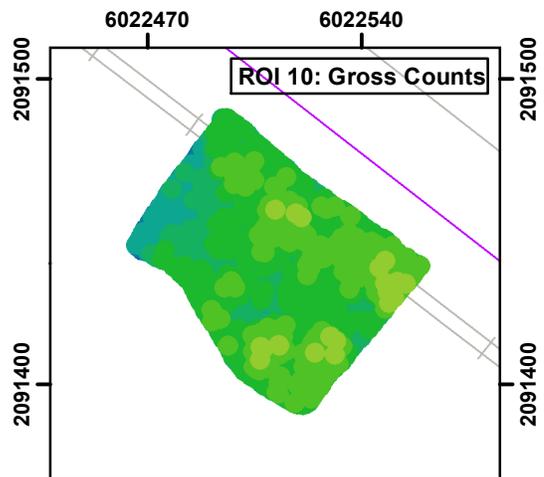
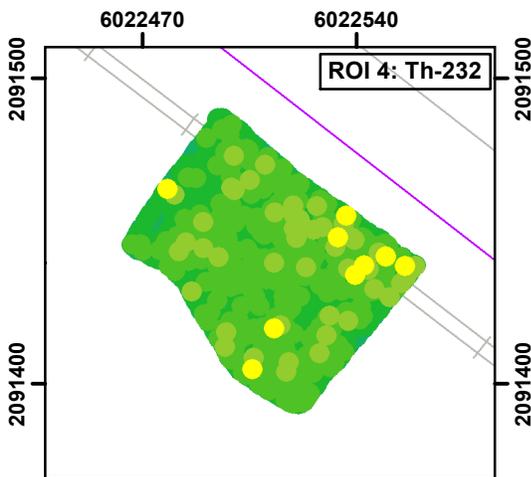
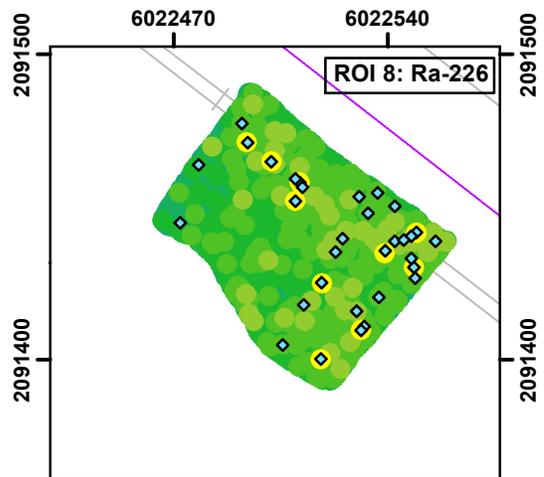
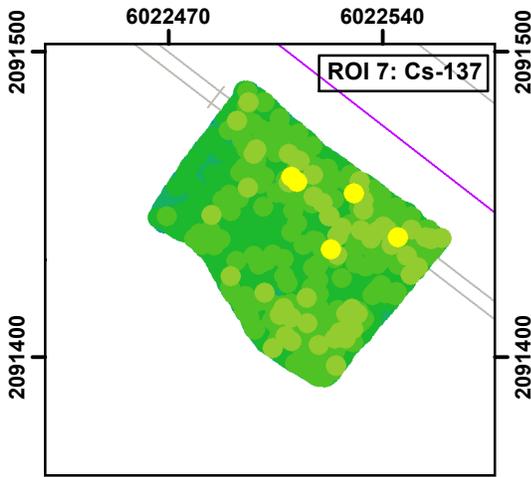
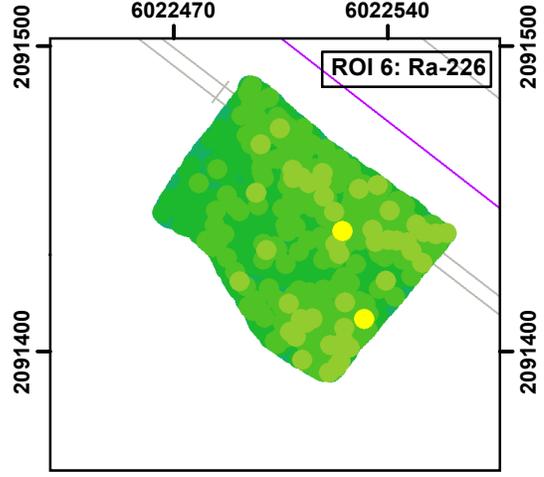
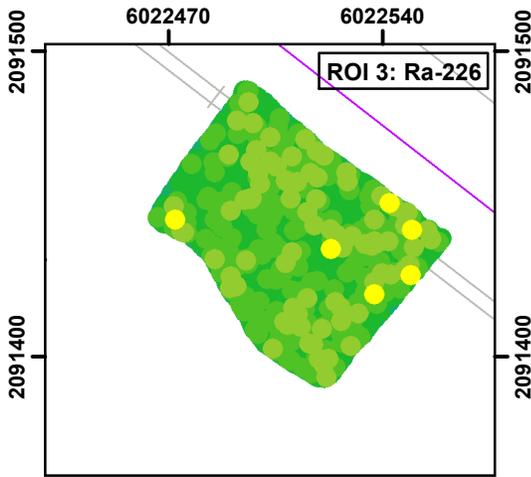
Soil Scan Statistics

Box Plots



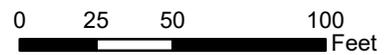
RSI Data Plots
HPNS Parcel G
RSY 38 Use 1

TU-107A SFU



RS 700 Gamma Walkover Survey Data (VD1)

- | | |
|--|--|
| ● > 3 std dev | ● > -1 to < 0 std dev |
| ● > 2 to < 3 std dev | ● > -2 to < -1 std dev |
| ● > 1 to < 2 std dev | ● > -3 to < -2 std dev |
| ● > 0 to < 1 std dev | ● < -3 std dev |

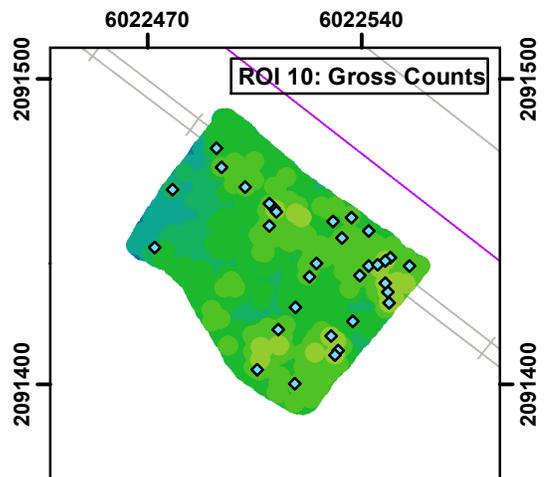
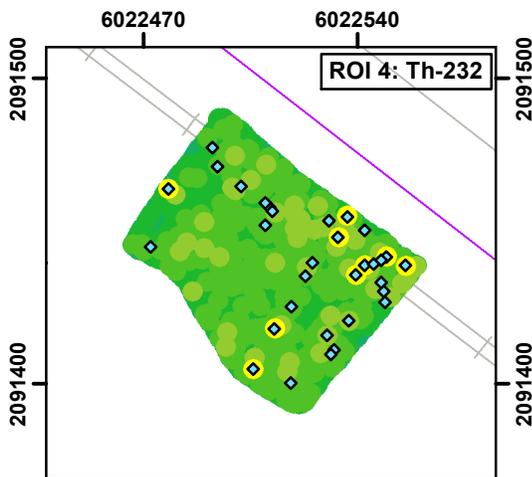
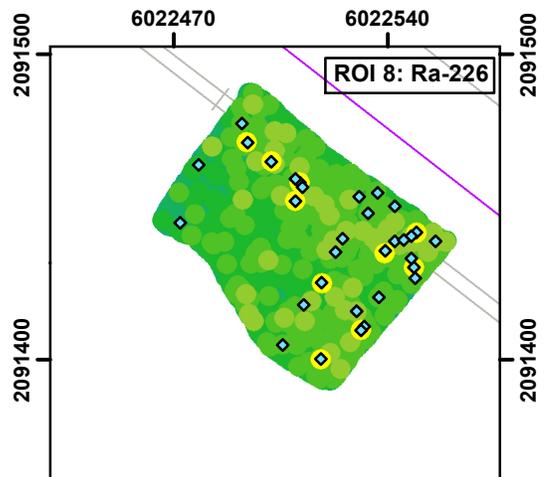
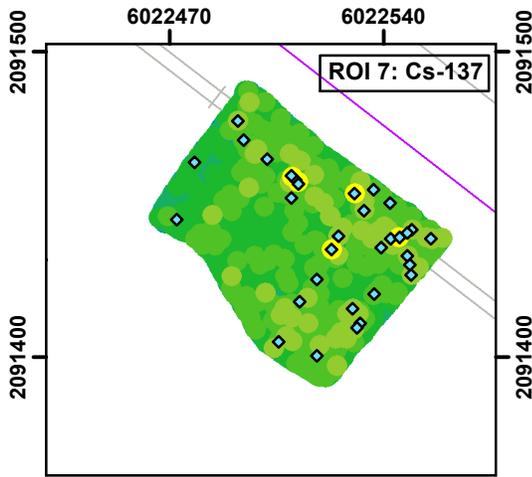
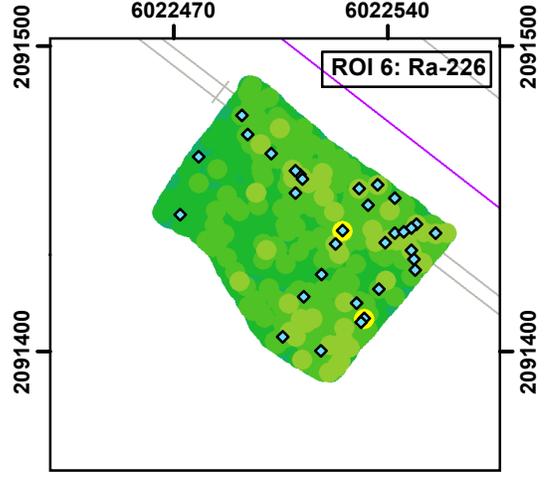
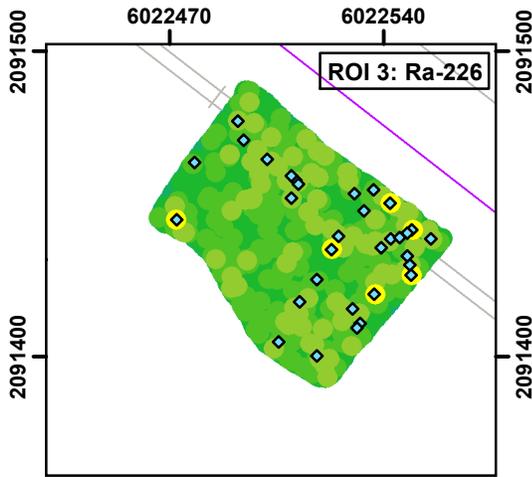


Coordinate system: CSP Zone III, NAD83, US Survey Foot



RSI Data Plots
HPNS Parcel G
RSY 38 Use 1

TU-107A SFU



RS 700 Gamma Walkover Survey Data (VD1)

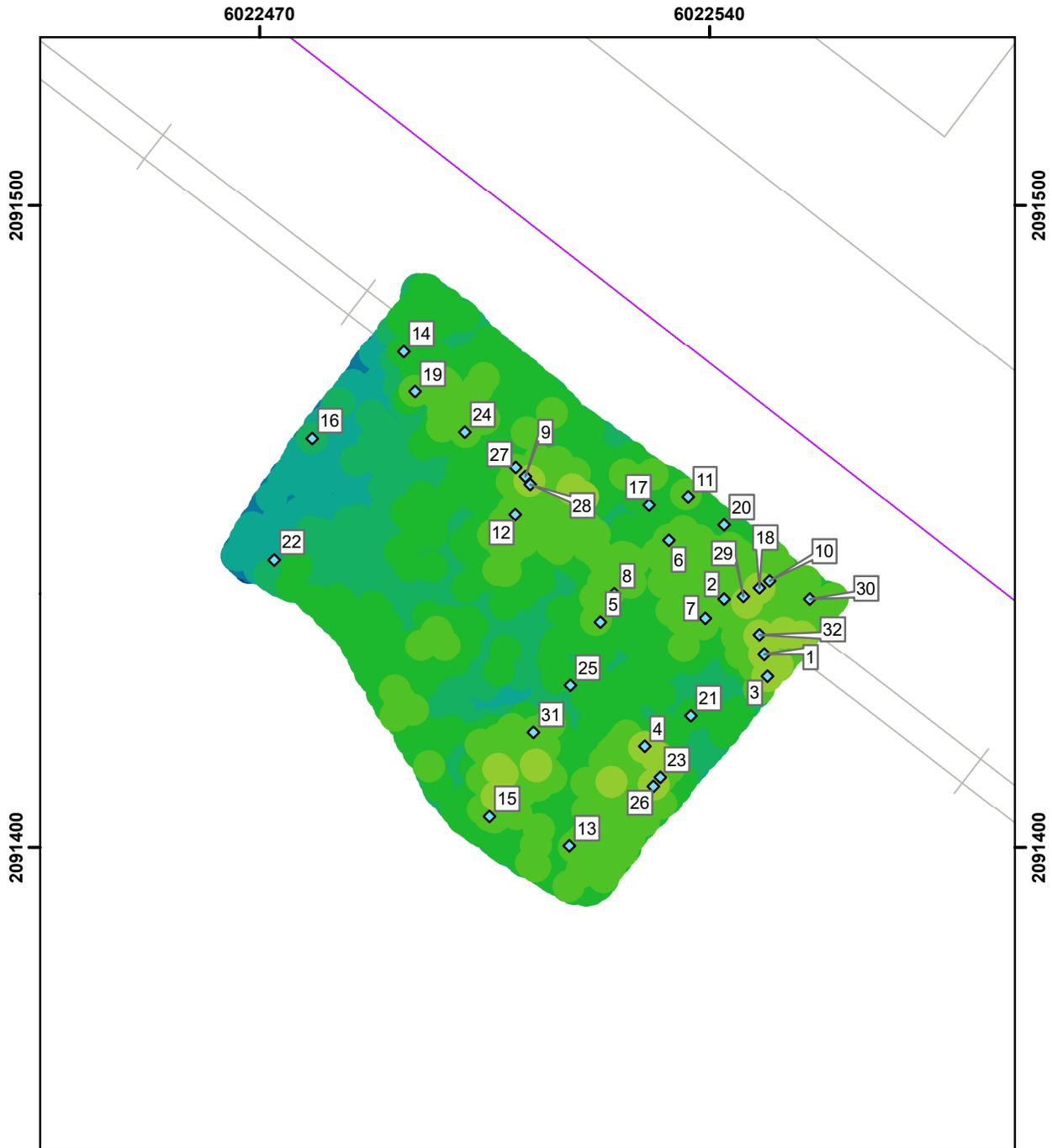
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● > 2 to < 3 std dev	● > -3 to < -2 std dev
● > 1 to < 2 std dev	● < -3 std dev
● > 0 to < 1 std dev	

0 25 50 100 Feet

Coordinate system: CSP Zone III, NAD83, US Survey Foot

Follow-Up Static Survey
HPNS Parcel G
RSY 38 Use 1

TU-107A SFU



RSY 38 Use 1 (VD1, ROI 10 Gross Gamma)

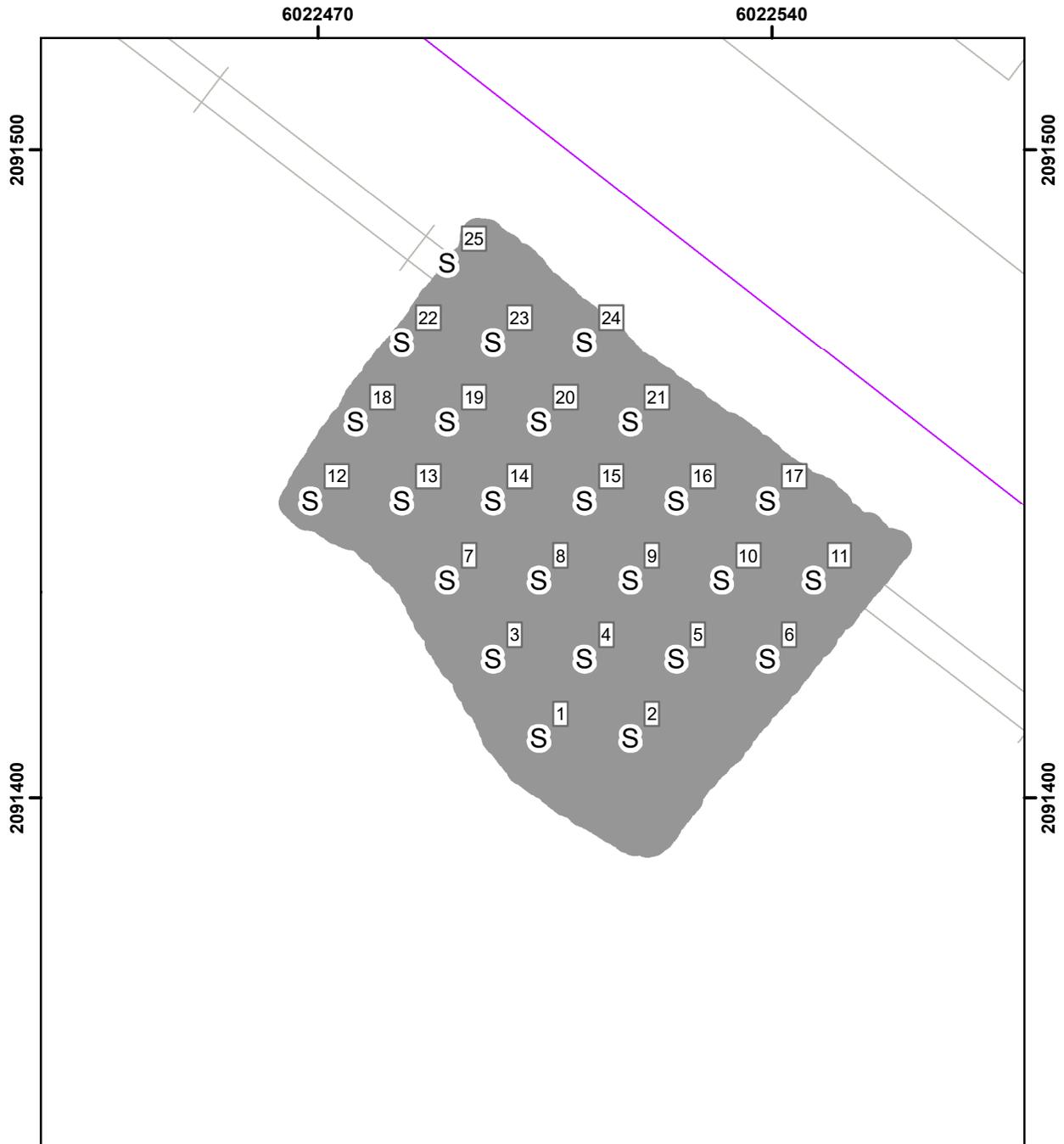
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● > 3 std dev	● > 0 to < 1 std dev	● > -3 to < -2 std dev
● > 2 to < 3 std dev	● > -1 to < 0 std dev	● < -3 std dev

20 10 0 20 Feet

Coordinate system: CSP Zone III, NAD83, US Survey Foot

Systematic Sampling
HPNS Parcel G
RSY 38 Use 1

TU-107A SFU



RSY 38 Use 1

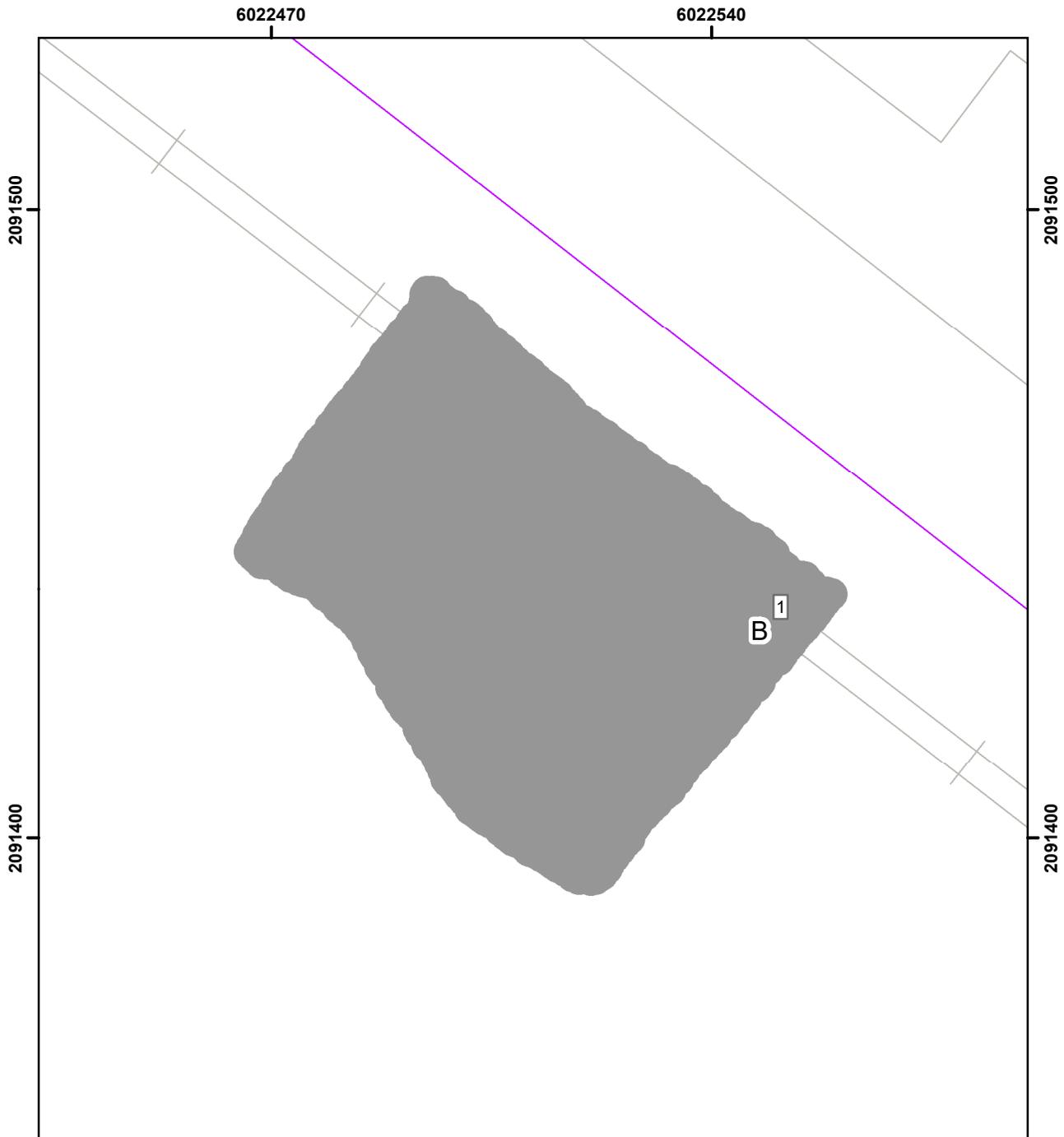
- S** Systematic Sample Locations
- RS-700 GWS Coverage

0 10 20 40 Feet

Coordinate system: CSP Zone III, NAD83, US Survey Foot

Biased Sampling
HPNS Parcel G
RSY 38 Use 1

TU-107A SFU



RSY 38 Use 1

- B** Biased Sample Location
- RS-700 GWS Coverage

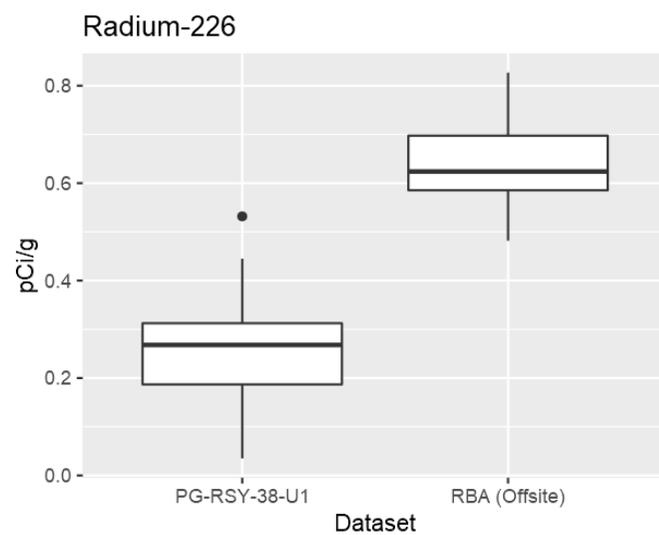
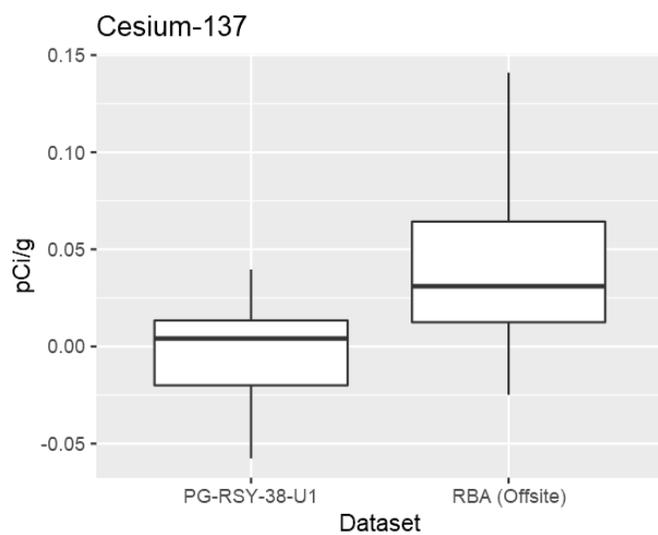
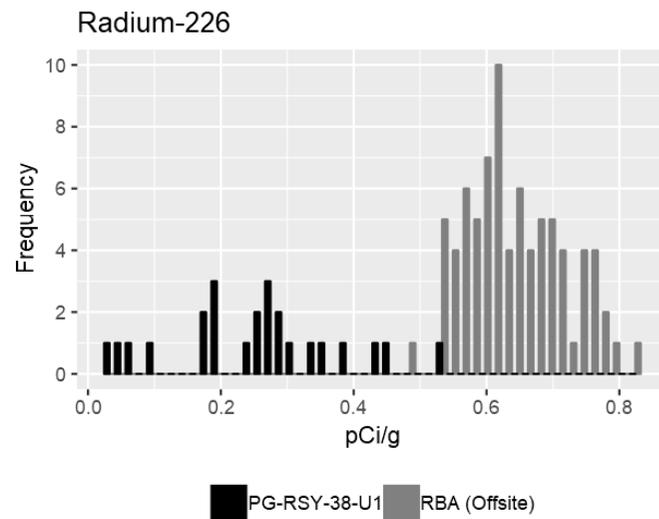
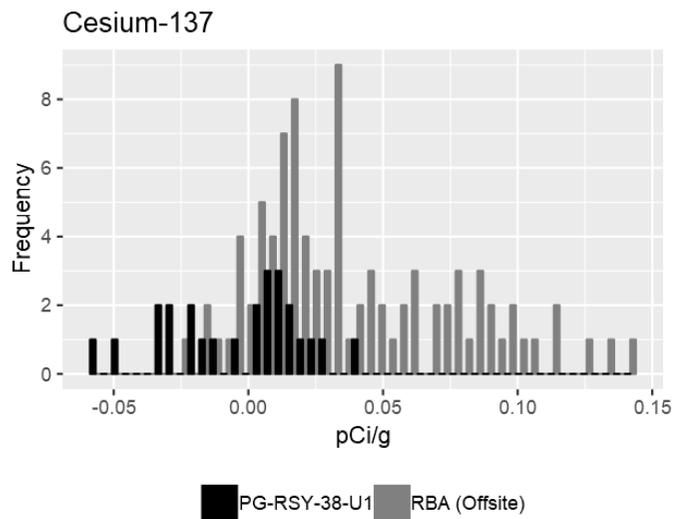
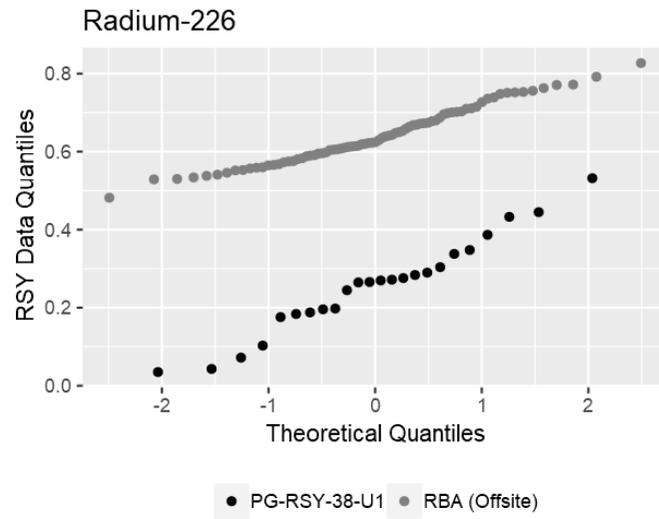
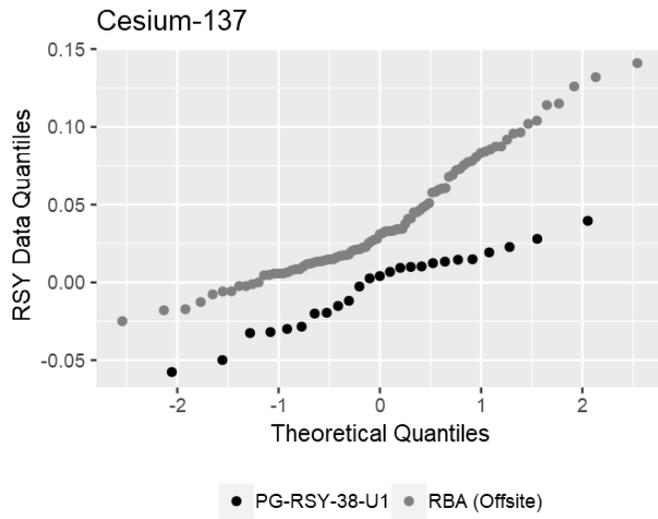
20 10 0 20 Feet



Coordinate system: CSP Zone III, NAD83, US Survey Foot



Soil Sample Statistics



WILCOXON RANK SUM TEST

Nuclide: **Ra-226**
 LBGR: **0.270** pCi/g

Location: **RSY 38 Use 1**

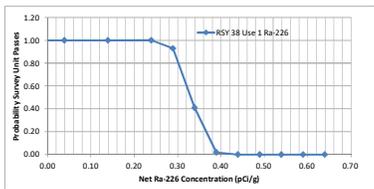
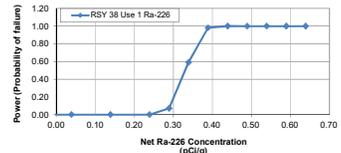
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 Median SU Data
 LBGR = **0.270**

DATA	AREA	ADJUSTED DATA	RANKS	SURVEY UNIT	Sorted Ranks	Location Associated with Sorted Rank
0.59	R	0.588	48.5	0	1	S
0.69	R	0.687	101	0	2	S
0.57	R	0.566	40	0	3	S
0.64	R	0.635	78.5	0	4	S
0.61	R	0.606	59	0	5	S
0.65	R	0.653	87.5	0	6	S
0.61	R	0.613	62	0	7	S
0.71	R	0.711	109	0	8	S
0.68	R	0.68	99.5	0	9	S
0.61	R	0.608	59	0	10	S
0.54	R	0.541	31	0	11	S
0.59	R	0.588	48.5	0	12	S
0.67	R	0.674	97	0	13	S
0.48	R	0.482	28	0	14	S
0.76	R	0.763	121	0	15	S
0.75	R	0.748	115	0	16	S
0.56	R	0.556	37.5	0	17.5	S
0.61	R	0.614	64	0	18	S
0.53	R	0.529	27	0	19	S
0.61	R	0.605	57	0	20	S
0.58	R	0.575	44	0	21	S
0.67	R	0.672	95	0	22	S
0.56	R	0.559	38	0	23	S
0.68	R	0.664	90.5	0	24	S
0.55	R	0.546	32	0	25	S
0.74	R	0.739	114	0	26	R
0.74	R	0.736	113	0	27	R
0.60	R	0.604	56	0	28	R
0.70	R	0.701	105	0	29	R
0.59	R	0.589	50.5	0	30	R
0.70	R	0.699	104	0	31	R
0.62	R	0.624	73.5	0	32	R
0.58	R	0.583	43	0	33	R
0.57	R	0.573	43	0	34	R
0.62	R	0.623	71	0	35	R
0.60	R	0.598	58	0	36	R
0.64	R	0.643	84	0	37.5	R
0.55	R	0.553	34	0	38	R
0.75	R	0.751	116.5	0	39	R
0.77	R	0.771	122	0	40	R
0.72	R	0.715	110.5	0	41.5	R
0.62	R	0.62	68	0	42	R
0.71	R	0.71	108	0	43	R
0.58	R	0.581	46	0	44	R
0.60	R	0.595	53	0	45	R
0.58	R	0.58	37.5	0	46	R
0.75	R	0.751	116.5	0	47	R
0.67	R	0.669	93.5	0	48.5	R
0.62	R	0.619	67.5	0	48.5	R
0.64	R	0.641	82.5	0	49	R
0.59	R	0.589	50.5	0	50.5	R
0.61	R	0.614	64	0	51	R
0.65	R	0.653	87.5	0	52	R
0.58	R	0.576	45	0	53	R
0.62	R	0.622	69.5	0	54	R
0.57	R	0.565	39	0	55	R
0.63	R	0.629	76.5	0	56	R
0.64	R	0.641	82.5	0	57	R
0.61	R	0.614	64	0	58	R
0.66	R	0.664	90.5	0	59	R
0.77	R	0.772	123	0	60	R
0.64	R	0.639	80.5	0	61	R
0.62	R	0.624	73.5	0	62	R
0.61	R	0.612	61	0	63	R
0.65	R	0.648	85	0	64	R
0.55	R	0.552	33	0	65	R
0.62	R	0.624	73.5	0	66	R
0.62	R	0.616	69.5	0	67	R
0.64	R	0.635	78.5	0	68	R
0.70	R	0.703	107	0	69.5	R
0.53	R	0.53	28	0	70	R
0.73	R	0.727	112	0	71	R
0.62	R	0.624	73.5	0	72	R
0.65	R	0.65	80.5	0	73.5	R
0.67	R	0.668	92	0	75	R
0.54	R	0.538	30	0	76.5	R
0.57	R	0.568	41.5	0	77.5	R
0.60	R	0.596	54	0	78.5	R
0.59	R	0.591	52	0	79.5	R
0.68	R	0.678	98	0	80.5	R
0.67	R	0.669	93.5	0	81	R
0.79	R	0.792	124	0	82.5	R
0.75	R	0.752	118	0	84	R
0.56	R	0.557	35	0	85	R
0.62	R	0.622	69.5	0	86	R
0.70	R	0.702	106	0	87.5	R
0.64	R	0.639	80.5	0	88.5	R
0.76	R	0.756	120	0	89	R
0.70	R	0.696	102.5	0	90.5	R
0.72	R	0.715	110.5	0	91.5	R
0.66	R	0.659	89	0	92	R
0.70	R	0.696	102.5	0	93.5	R
0.63	R	0.629	76.5	0	94.5	R
0.68	R	0.68	99.5	0	95	R
0.53	R	0.534	29	0	96	R
0.61	R	0.61	60	0	97	R
0.83	R	0.827	125	0	98	R
0.75	R	0.753	119	0	99.5	R
0.57	R	0.568	41.5	0	100	R
0.188	S	-0.082	7	7	101	R
0.338	S	0.066	20	20	102.5	R
0.272	S	0.002	14	14	102.5	R
0.196	S	-0.074	8	8	104	R
0.483	S	0.163	23	23	105	R
0.265	S	-0.005	11	11	106	R
0.304	S	0.034	19	19	107	R
0.348	S	0.076	21	21	108	R
0.387	S	0.117	22	22	109	R
0.0352	S	-0.2348	1	1	110.5	R
0.632	S	0.262	25	25	110.5	R
0.29	S	0.02	17.5	17.5	112	R
0.103	S	-0.167	4	4	113	R
0.296	S	-0.004	12	12	114	R
0.245	S	-0.025	10	10	115	R
0.178	S	-0.094	5	5	116.5	R
0.276	S	0.006	15	15	116.5	R
0.184	S	-0.086	6	6	118	R
0.0432	S	-0.2268	2	2	119	R
0.0721	S	-0.1979	3	3	120	R
0.198	S	-0.072	9	9	121	R
0.284	S	0.014	16	16	122	R
0.27	S	0	13	13	123	R
0.445	S	0.176	24	24	124	R
0.29	S	0.02	17.5	17.5	125	R
Sum =			7876	325		

POWER CURVE CALCULATION

Concentration (C)	above Background (C-LBGR)	SD	p1	p2	E(Wmw)	Var(Wmw)	SD(Wmw)	z	Power	Probability of passing
0.8	-0.06	-2.7	0.03855	0.00647	96.375	2236.871	47.31459	32.3363	0.00	1.00
0.9	0.04	-1.9	0.08956	0.02771	223.888	6259.712	79.11634	17.7262	0.00	1.00
1	0.14	-1.1	0.21834	0.09889	545.845	16176.98	127.1887	8.49533	0.00	1.00
1.1	0.24	-0.3	0.41600	0.25342	1040.01	25318.47	159.1178	3.68501	0.00	1.00
1.15	0.29	0.2	0.55623	0.39139	1390.58	25831.81	161.7226	1.46998	0.07	0.93
1.2	0.34	0.6	0.66431	0.51339	1660.78	22720.64	150.7337	-2.284	0.59	0.41
1.25	0.39	1.0	0.76025	0.63370	1900.63	17590.17	132.6279	-2.068	0.98	0.02
1.3	0.44	1.4	0.83899	0.74170	2097.25	12005.37	109.569	-4.2977	1.00	0.00
1.35	0.49	1.8	0.89845	0.83002	2246.14	7239.827	85.08717	-7.2841	1.00	0.00
1.4	0.54	2.2	0.94010	0.89592	2350.26	3868.703	62.1989	-11.639	1.00	0.00
1.45	0.59	2.6	0.96700	0.94062	2417.51	1838.749	42.88064	-18.45	1.00	0.00
1.5	0.64	3.0	0.98305	0.96880	2457.63	760.2027	27.93211	-29.761	1.00	0.00

Number of Samples	
LBGR	0.270
Δ/c	5.99
N	25.23
N/2	13
Actual N	25
SU σ	0.122
Z(1-α/2)	2.326
Z(1-β)	1.645



QUANTILE TEST

From NUREG 1505, Table A.7b Values of r and k for the Quantile Test When α is Approximately 0.025

25 n (number of survey unit measurements)
 10 m (number of reference area measurements)

Use:
 $m = 100$
 $n = 25$
 $r = 4$
 $k = 3$
 0.025 alpha

If k or more of the r largest measurements in the combined ranked data set are from the survey unit, the null hypothesis of the Quantile test (that there is no residual radioactivity above the LBGR in any part of the survey unit) is rejected.

0 of the largest 4 adjusted measurements are from S. The null hypothesis is accepted.

of R: 100 n
 # of S: 25 m
 Avg Rank R: 73.5
 Avg Rank S: 13

For m or n greater than 20, the critical value (k) can be calculated from

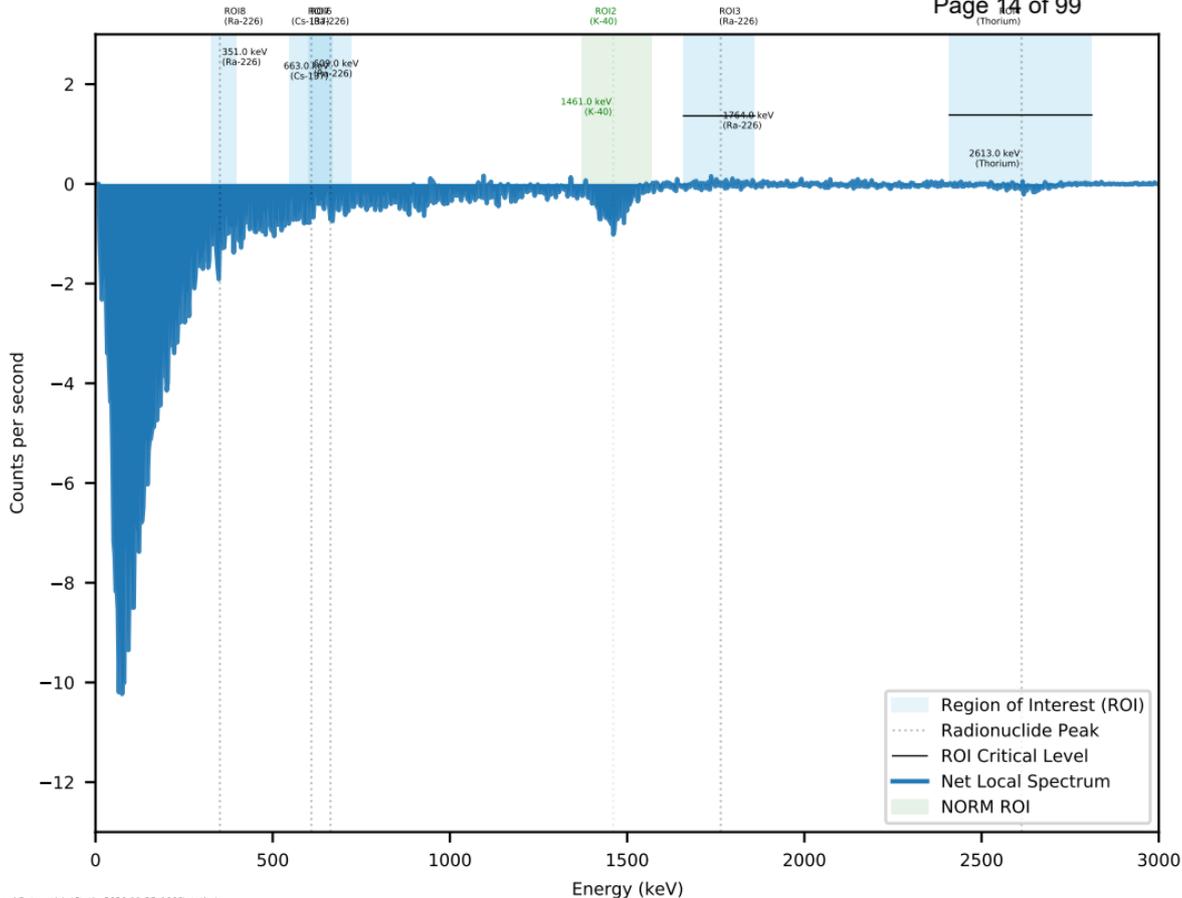
$$\frac{m(n+m+1)}{2} + z \sqrt{\frac{nm(n+m+1)}{12}}$$

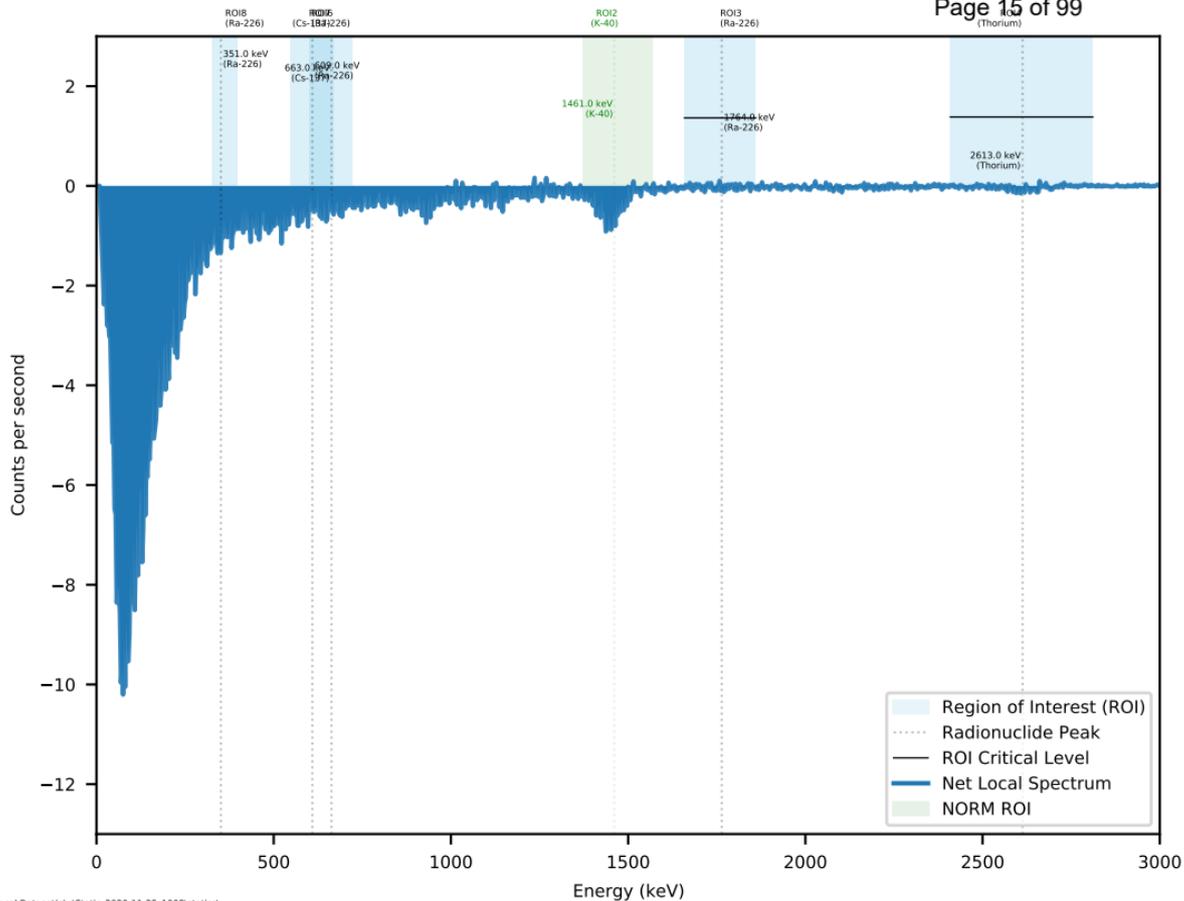
$z = 99.0\%$ percentile of standard normal distribution = 2

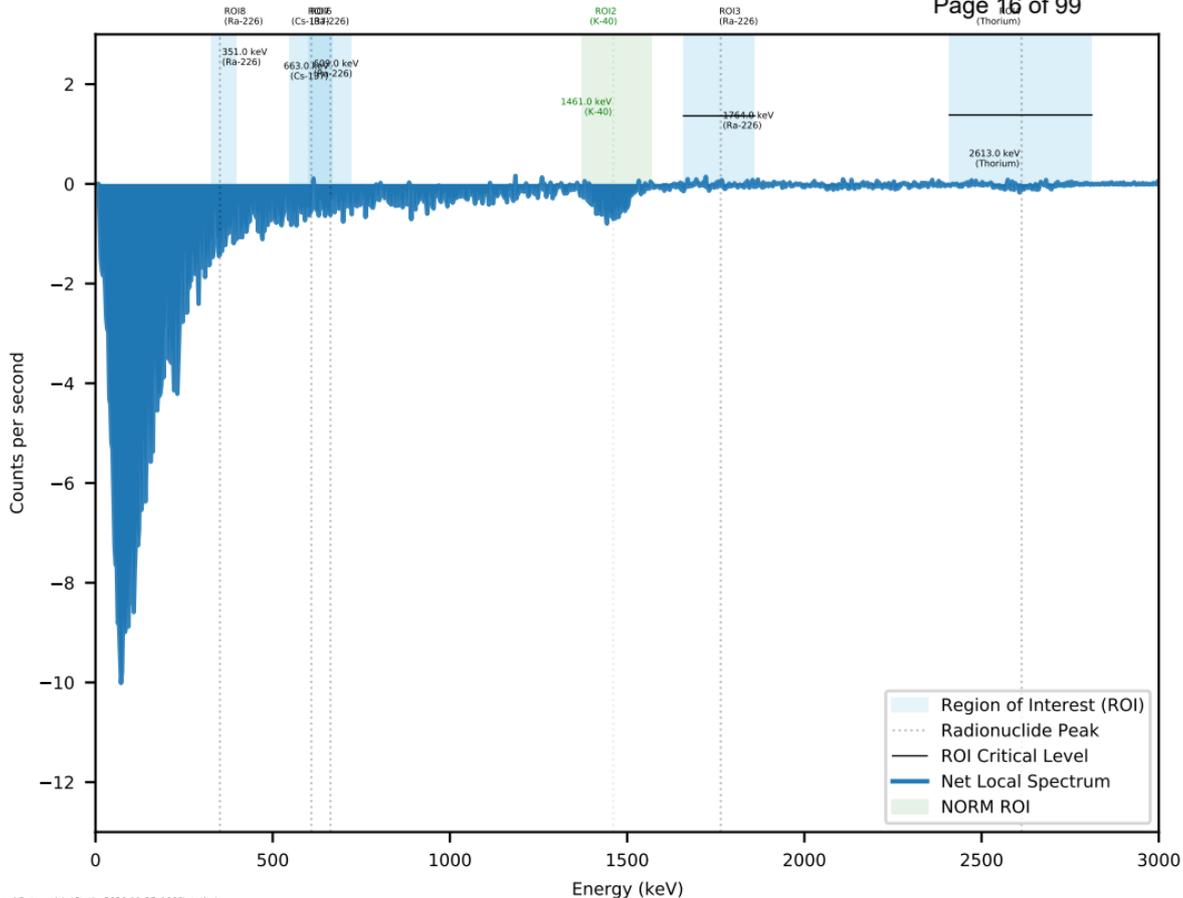
$k = 1951.9$

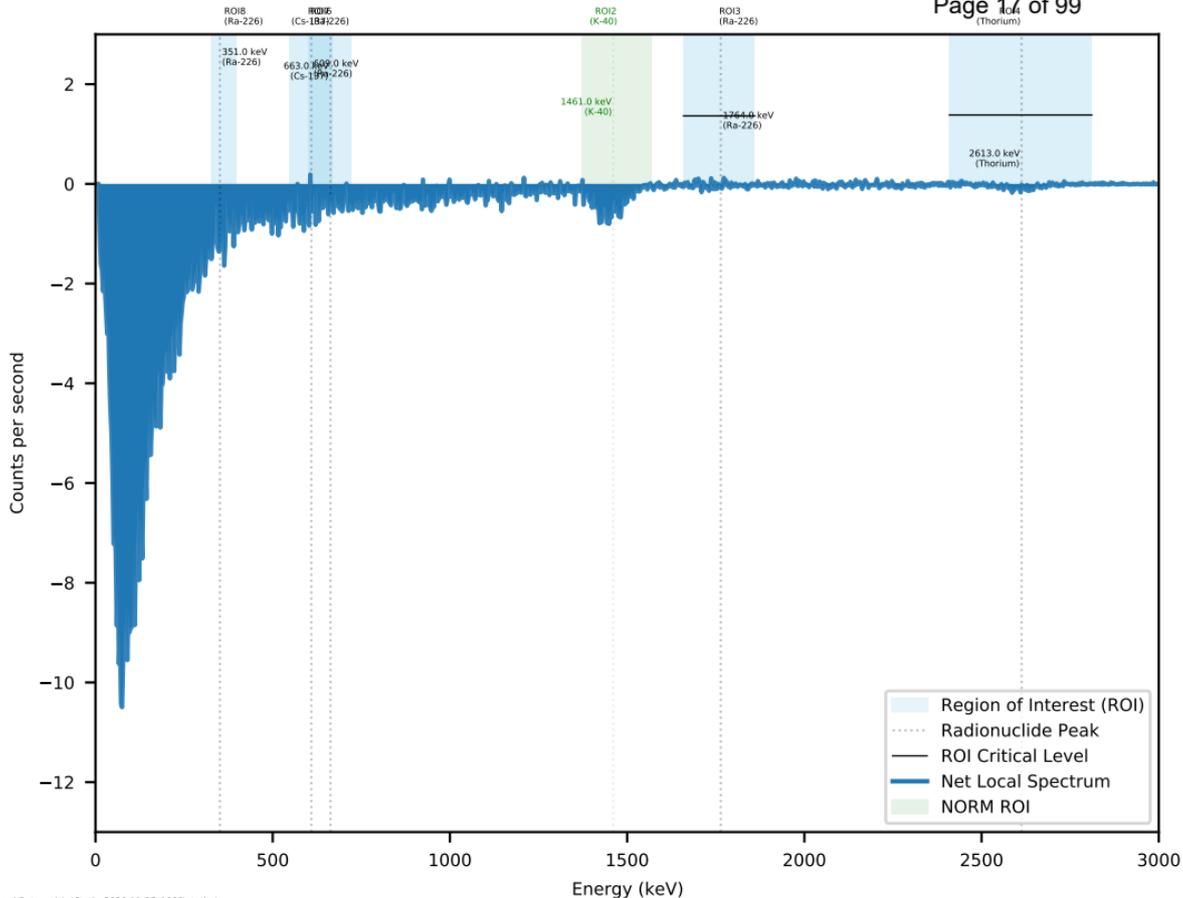
$\alpha = \alpha/2 = 0.01$
 $\beta = 0.05$

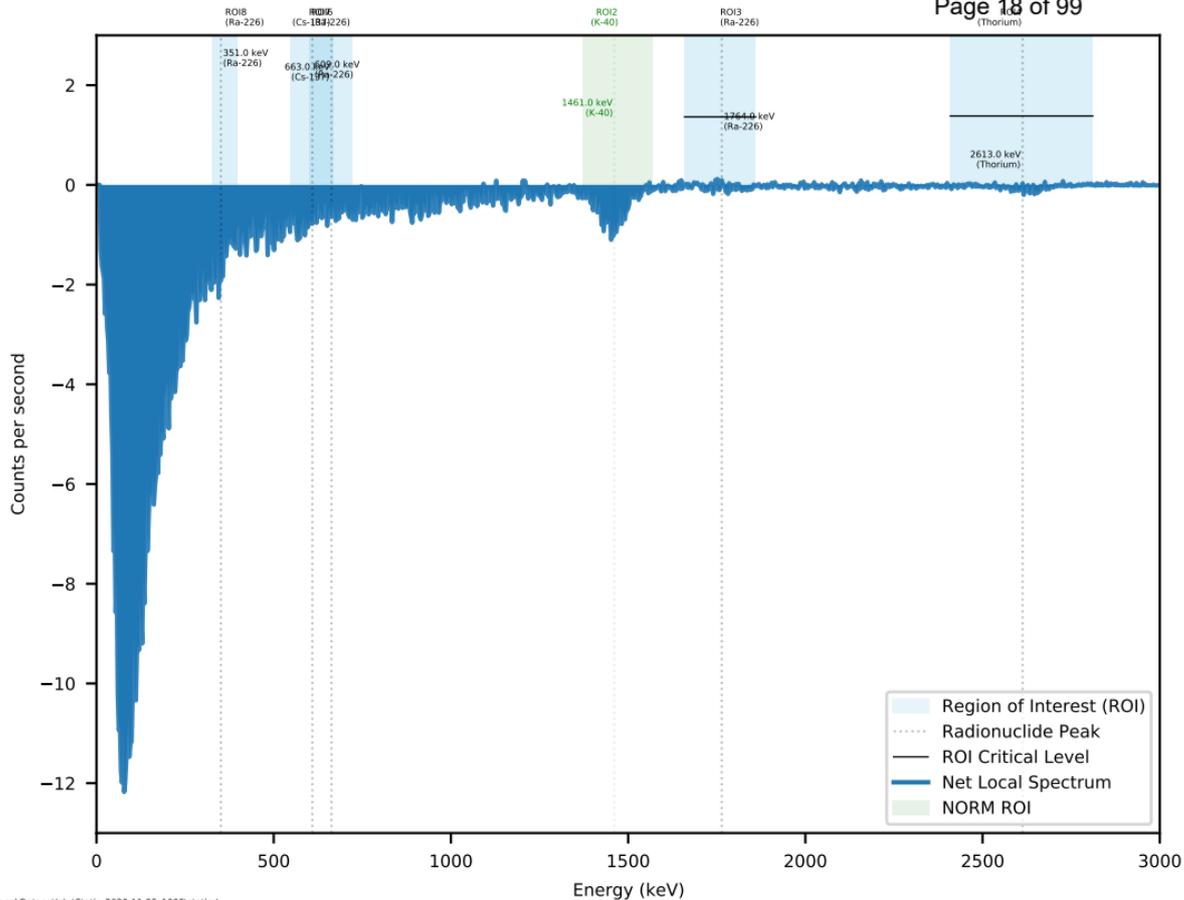
Since the sum of survey unit ranks is less than the critical value, the null hypothesis that the survey unit concentrations do not exceed the LBGR is accepted (i.e., survey unit passes).

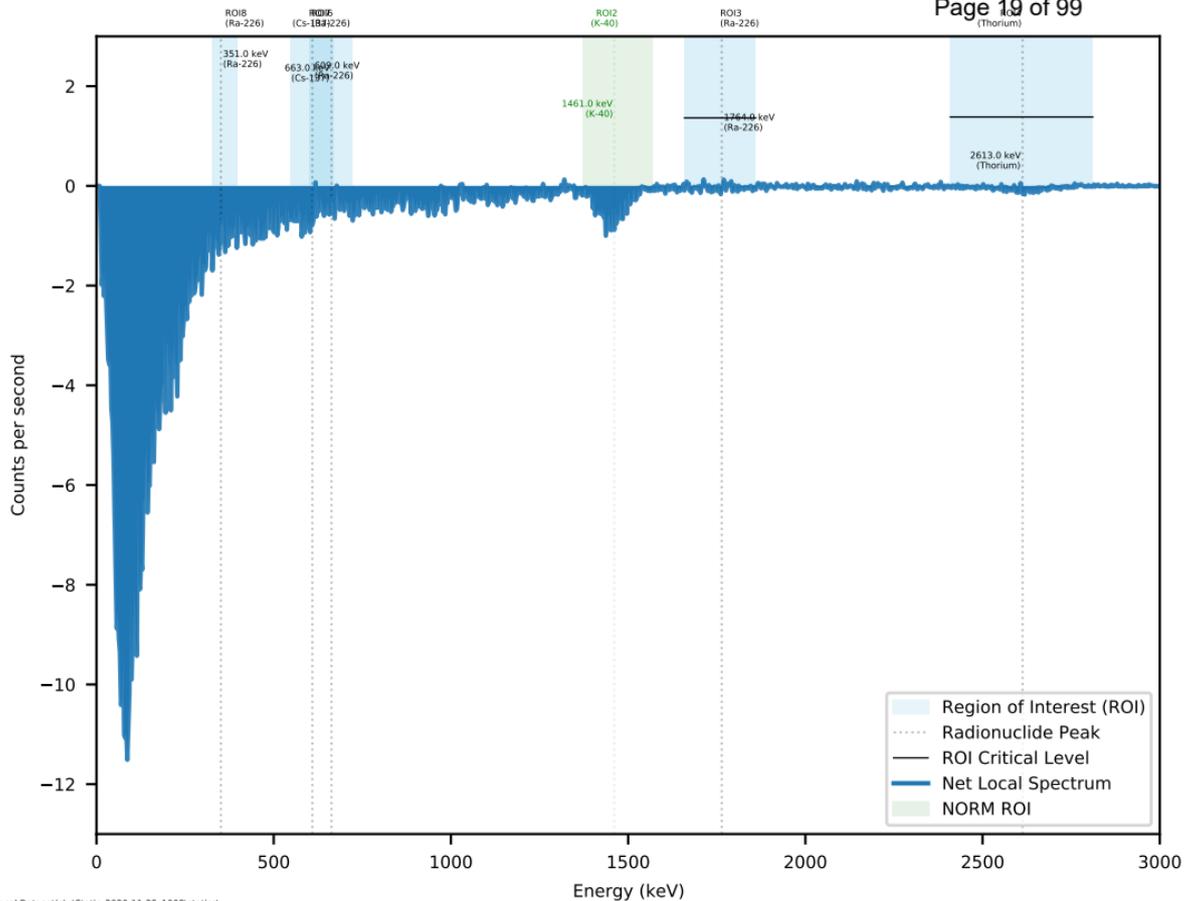


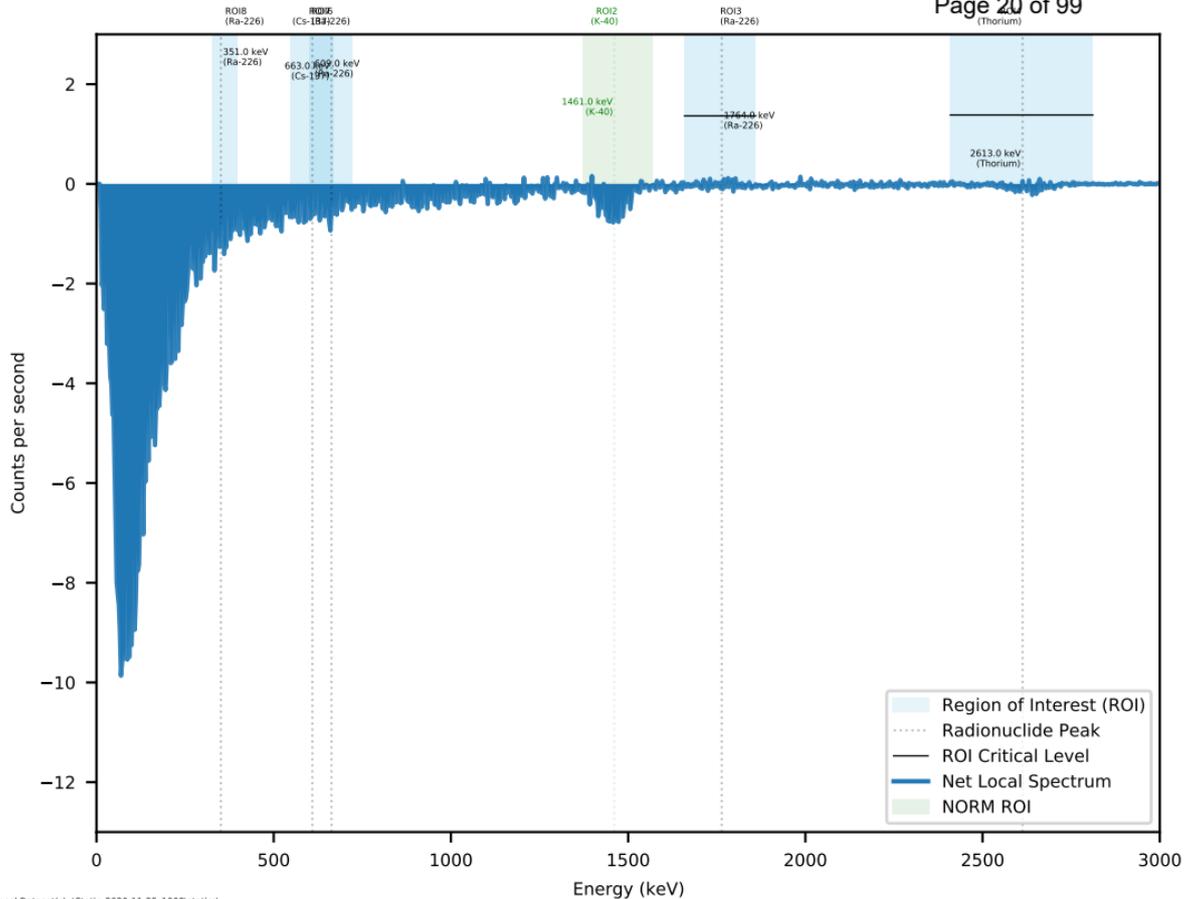


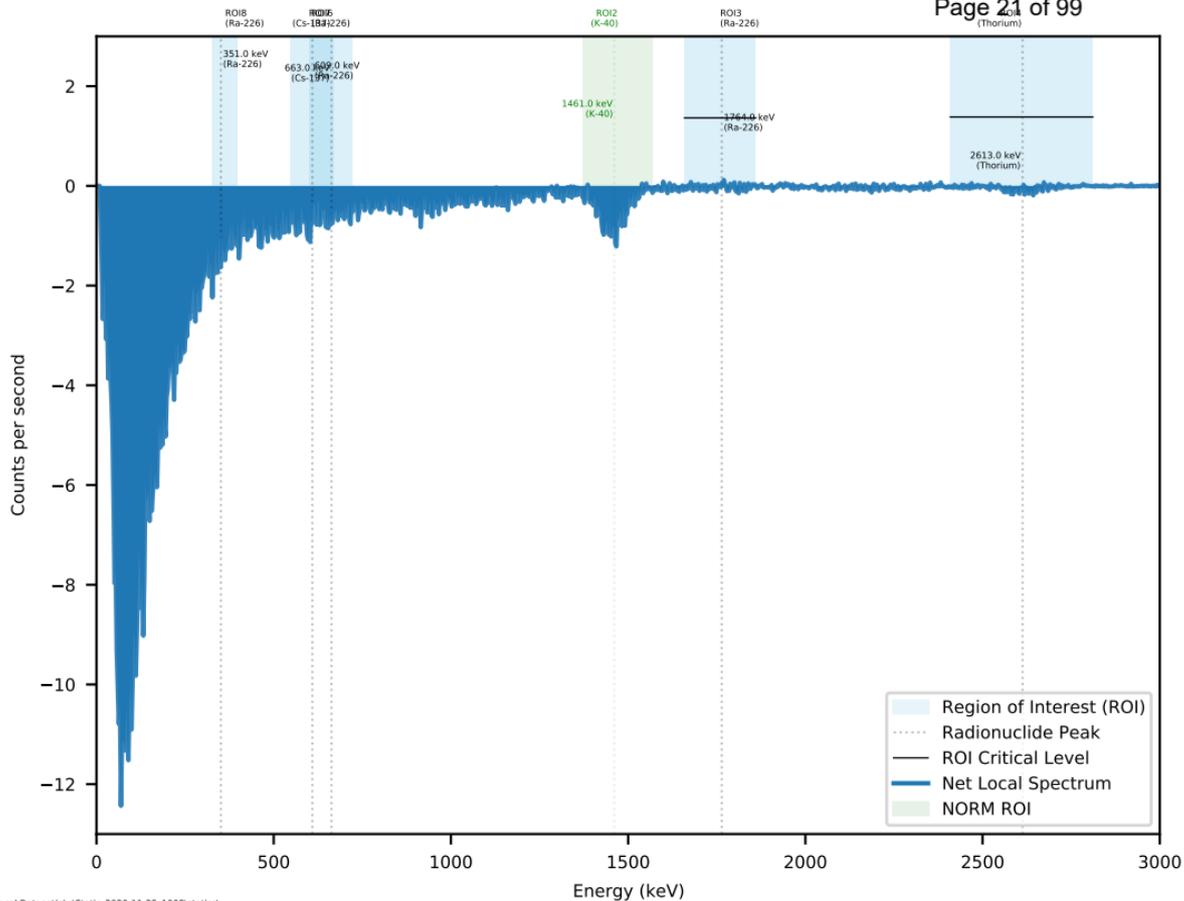


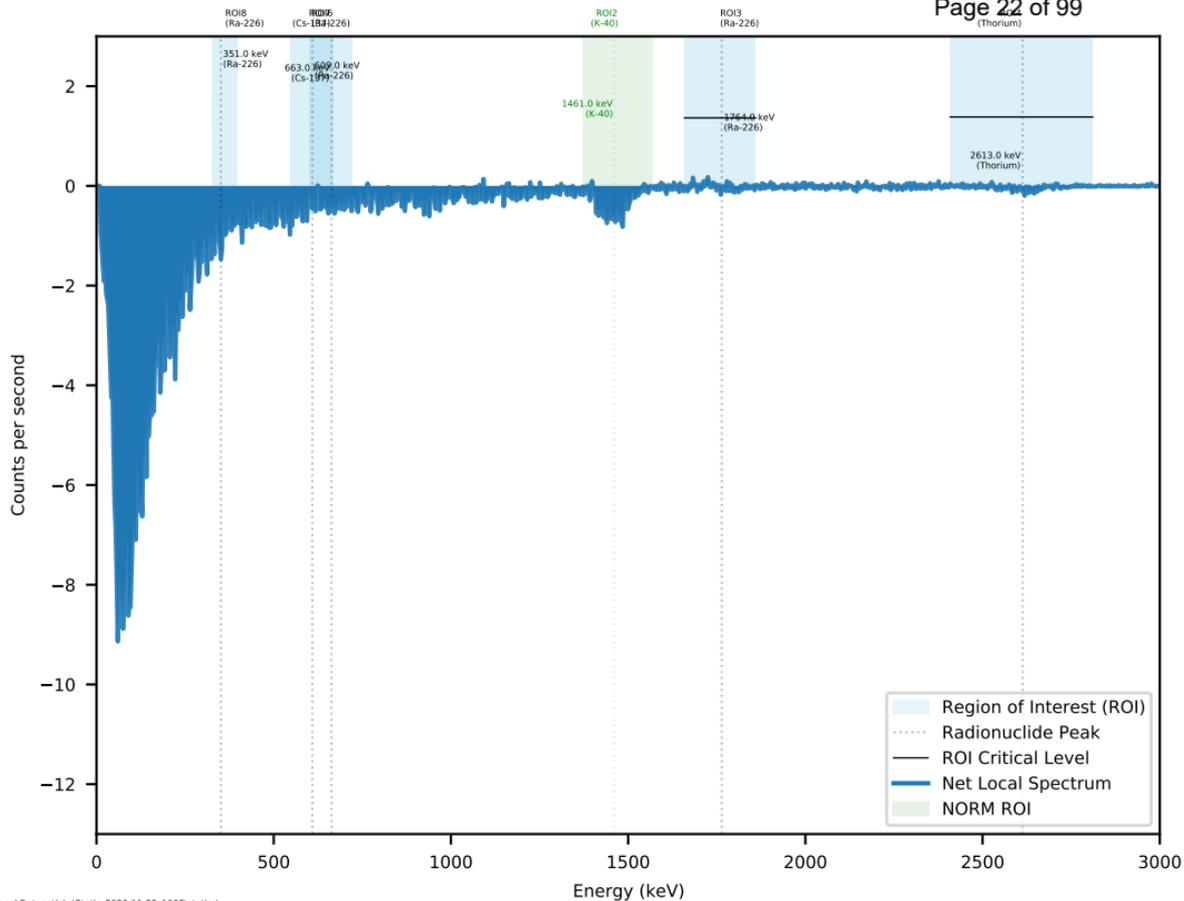


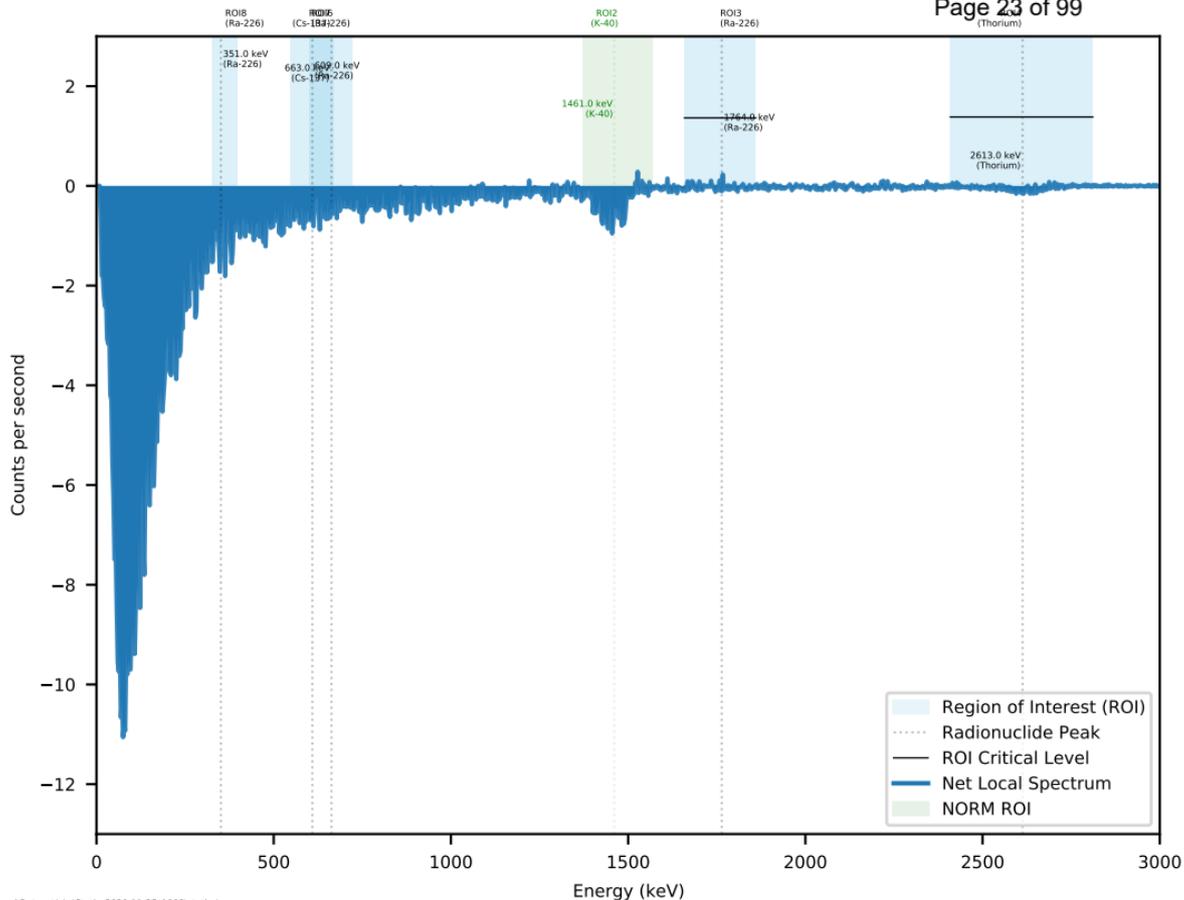


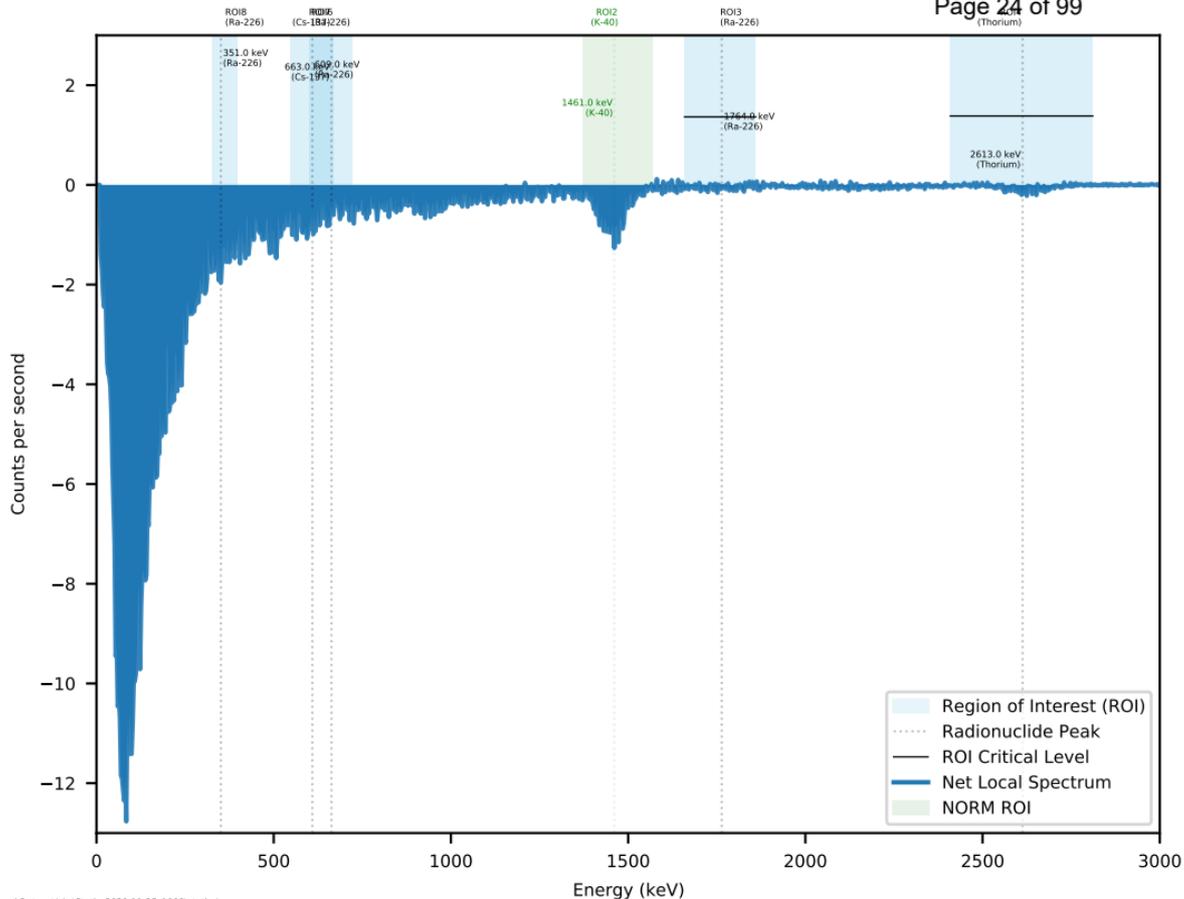


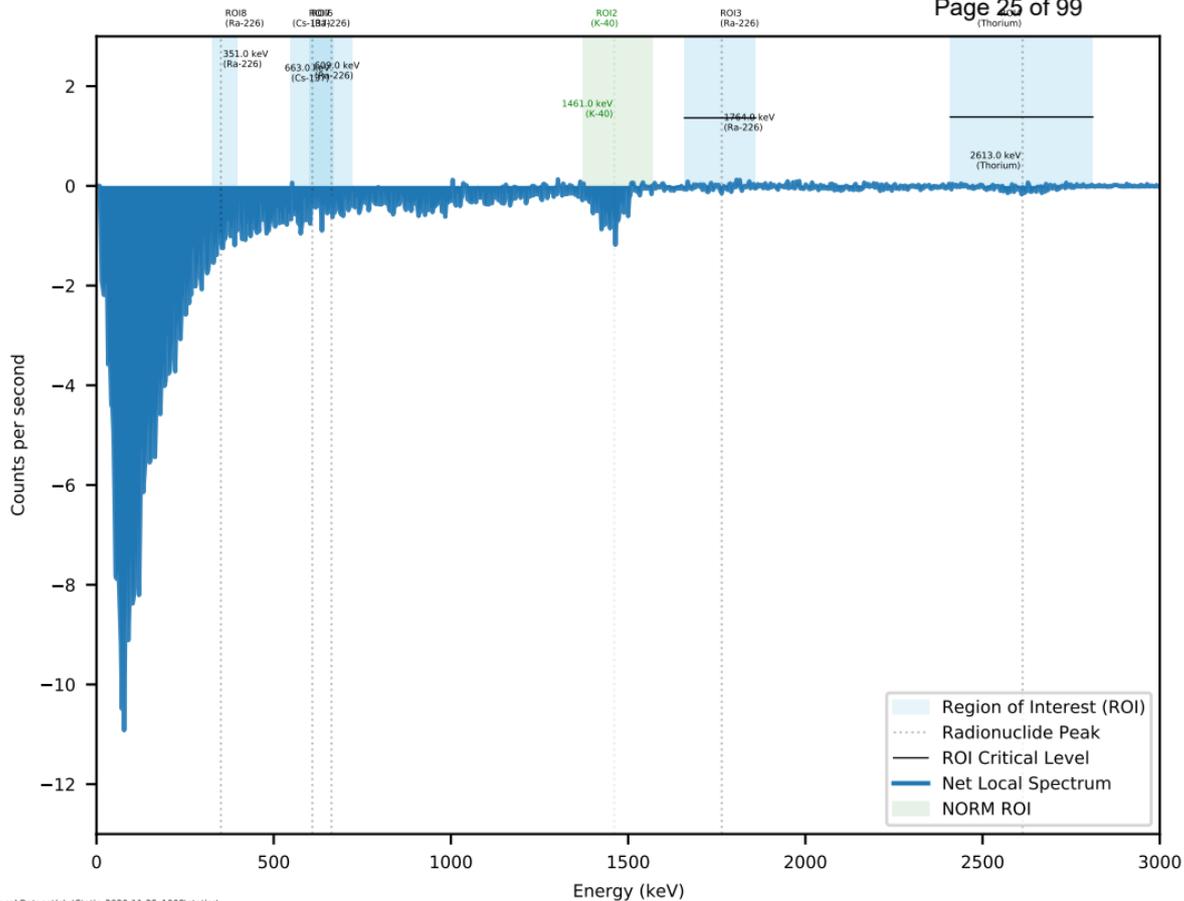


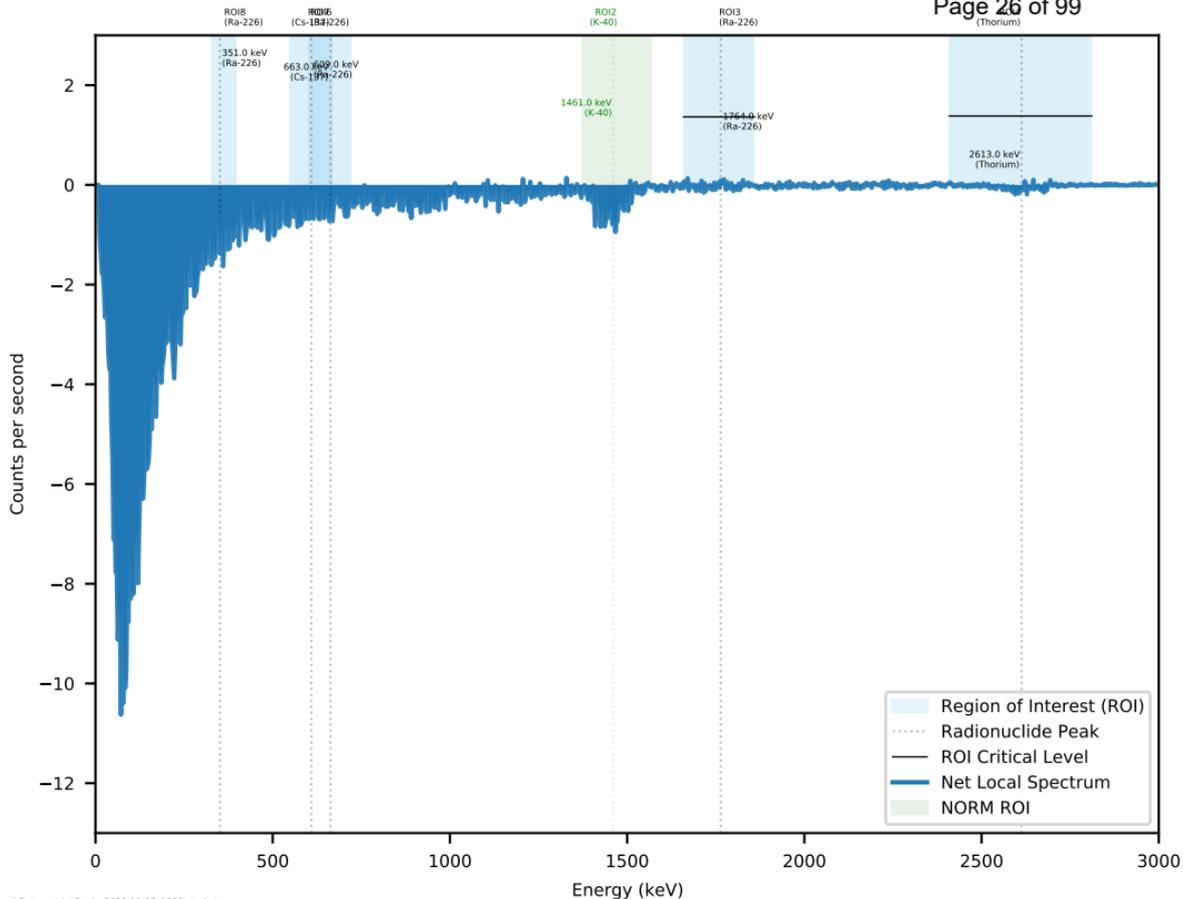


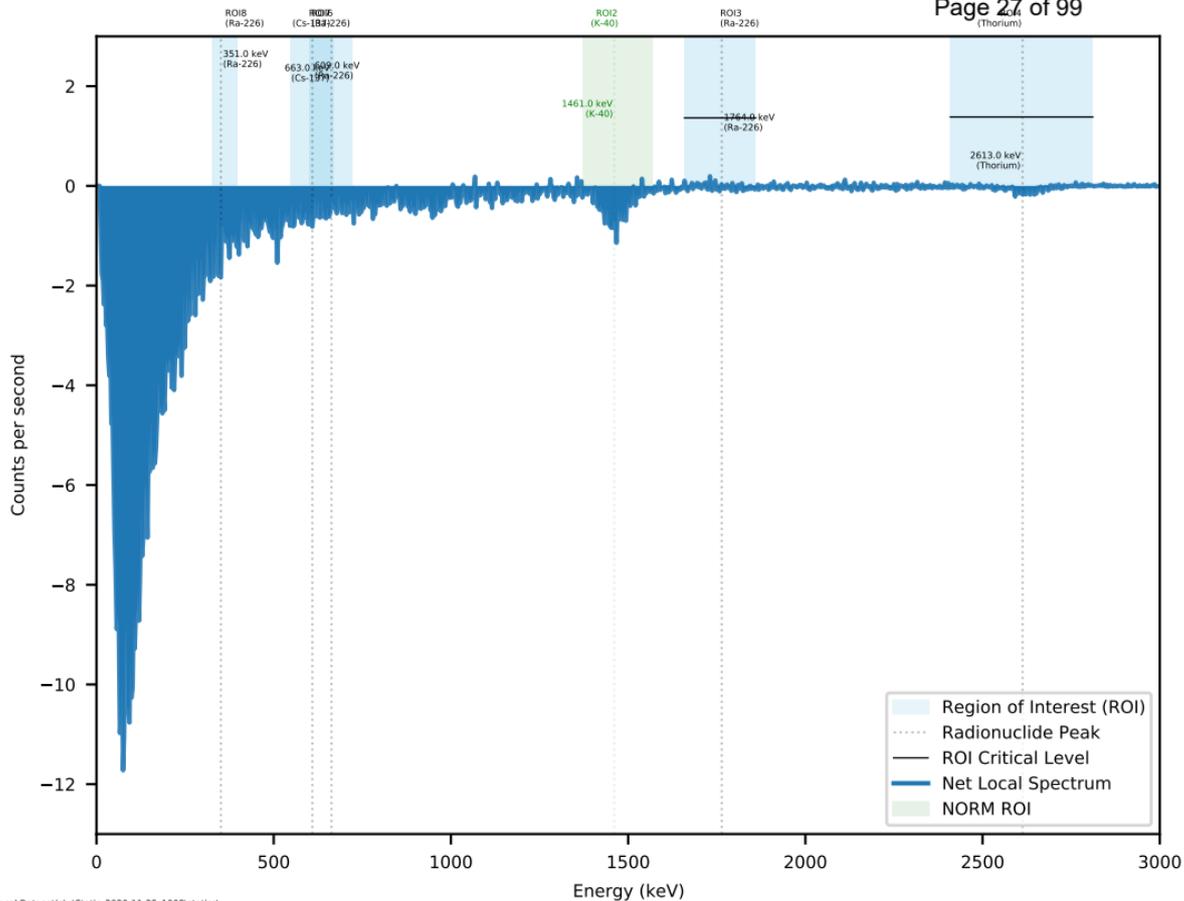


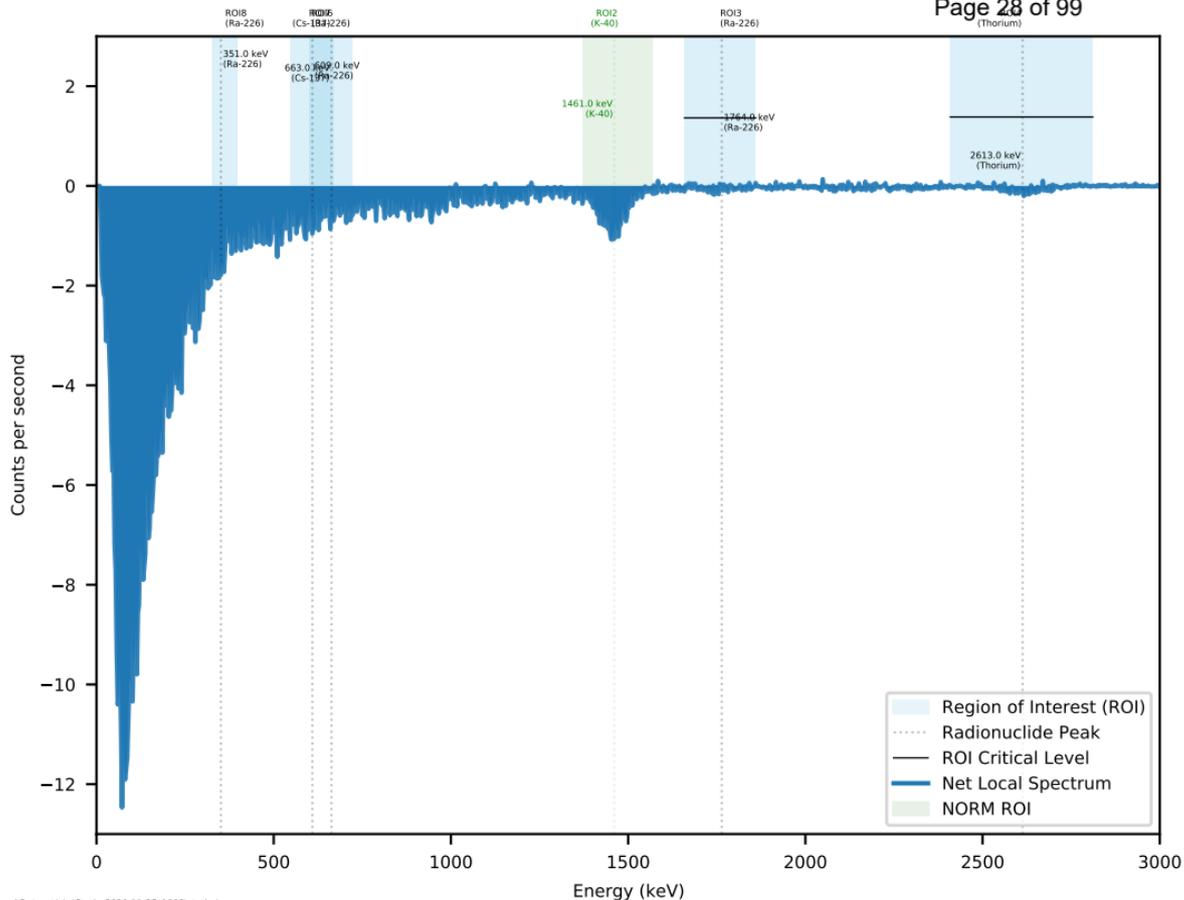


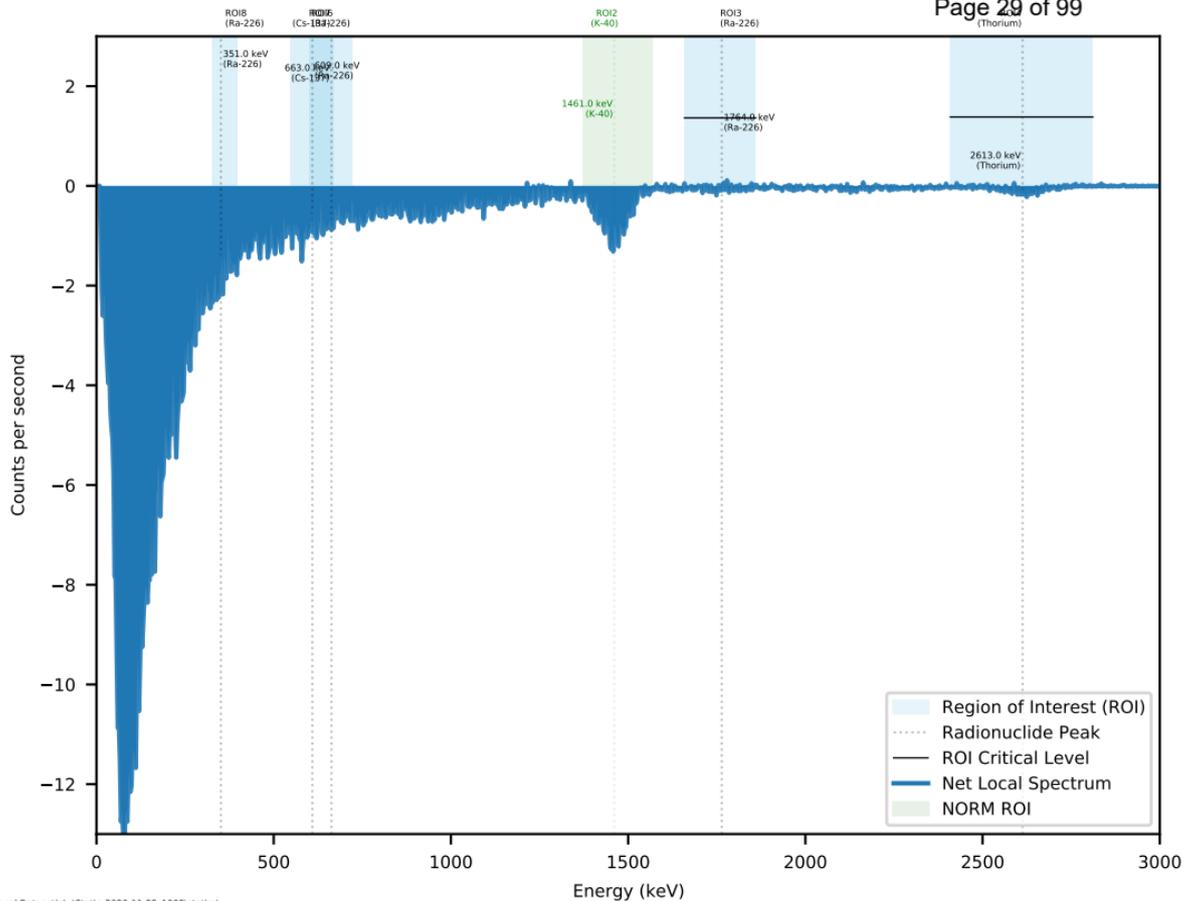


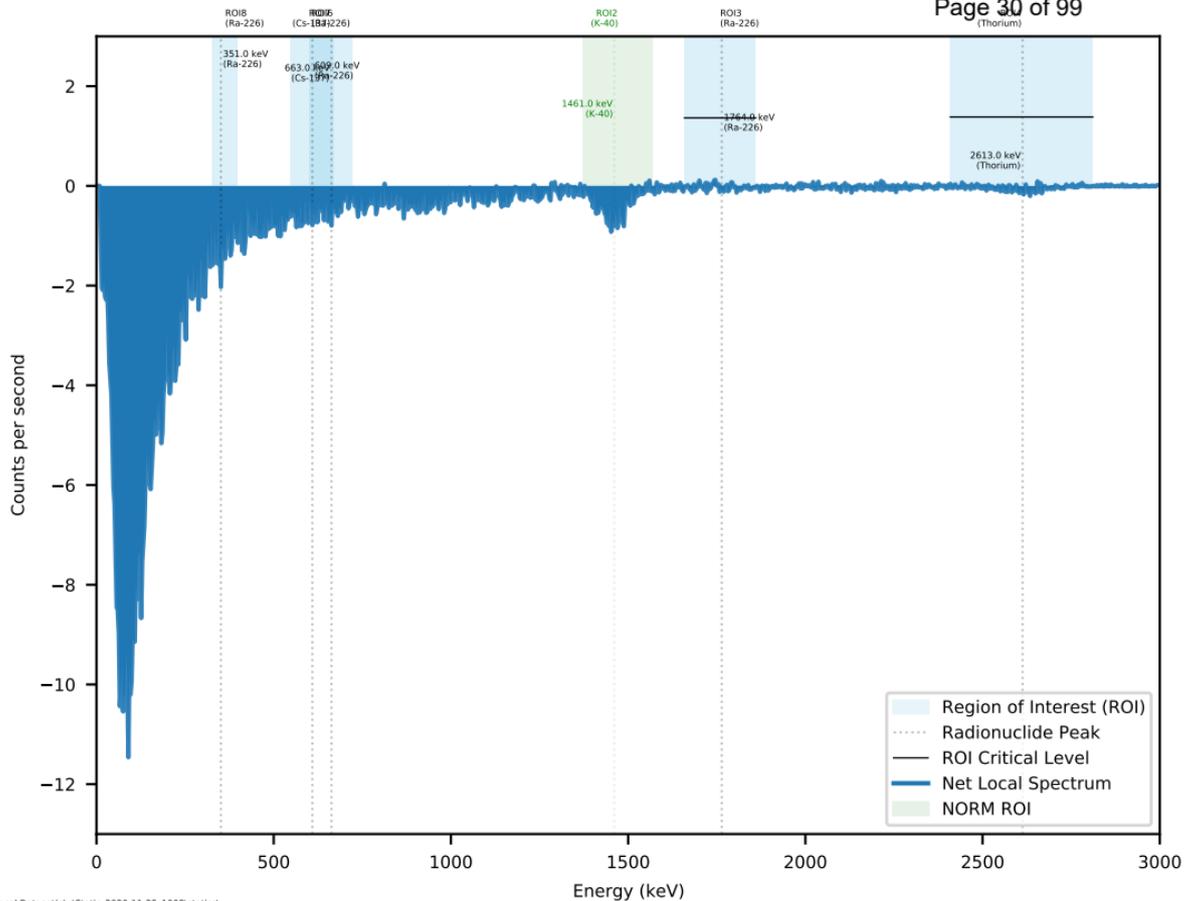


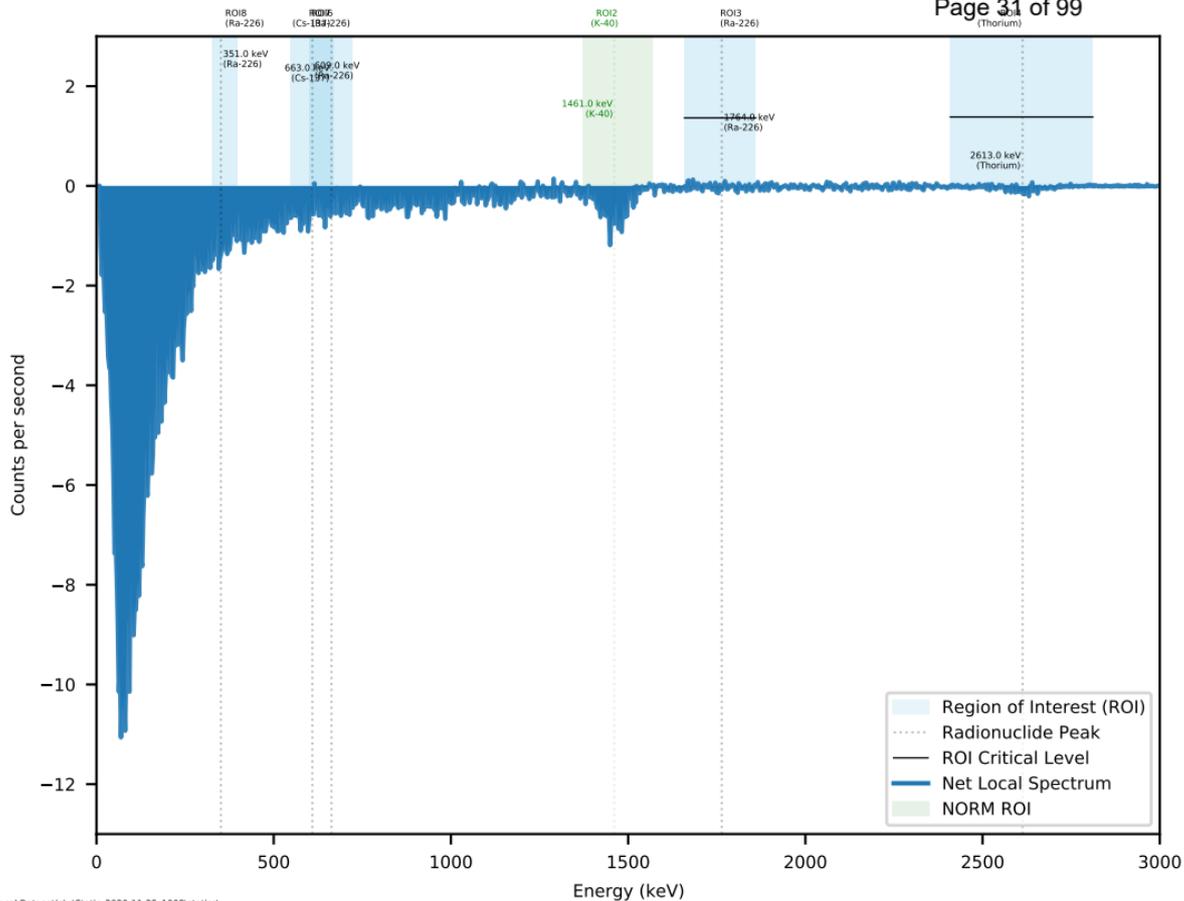


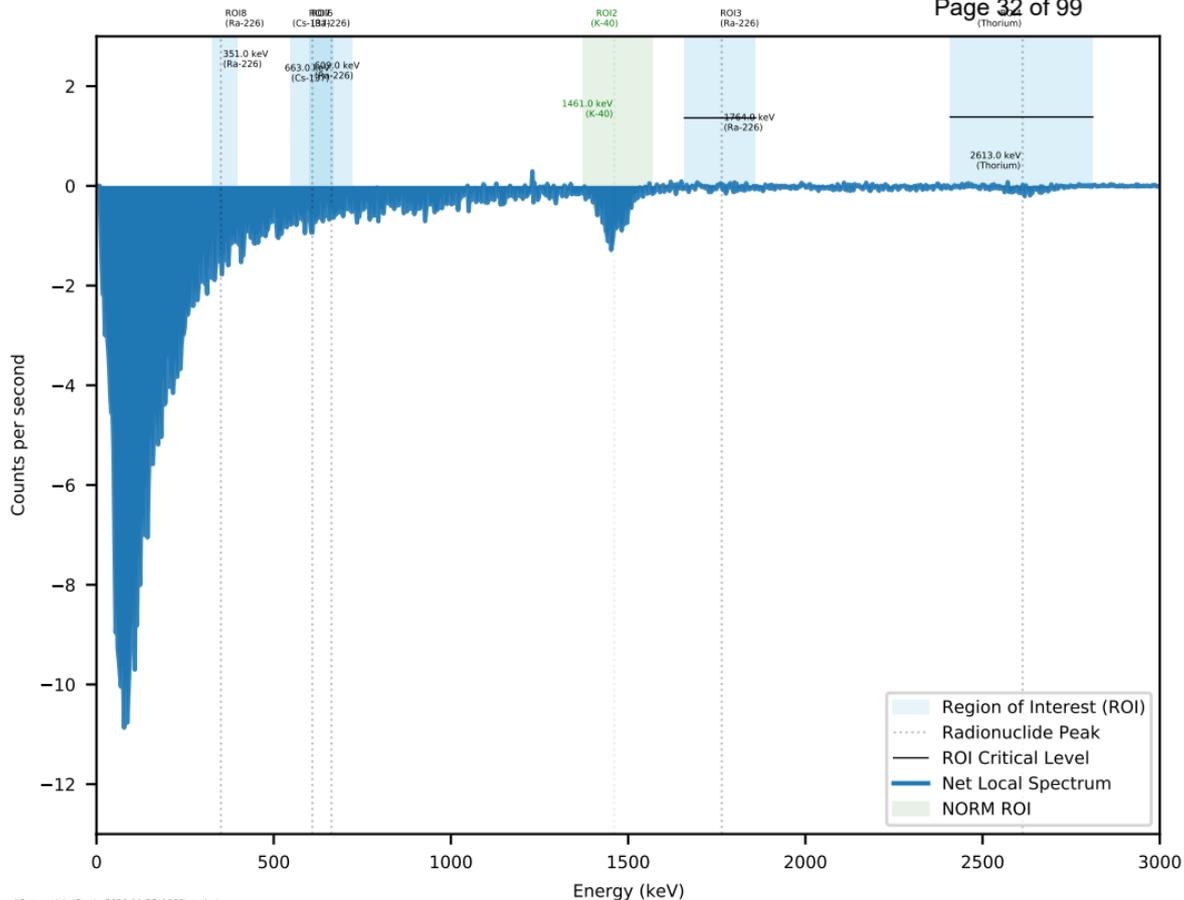


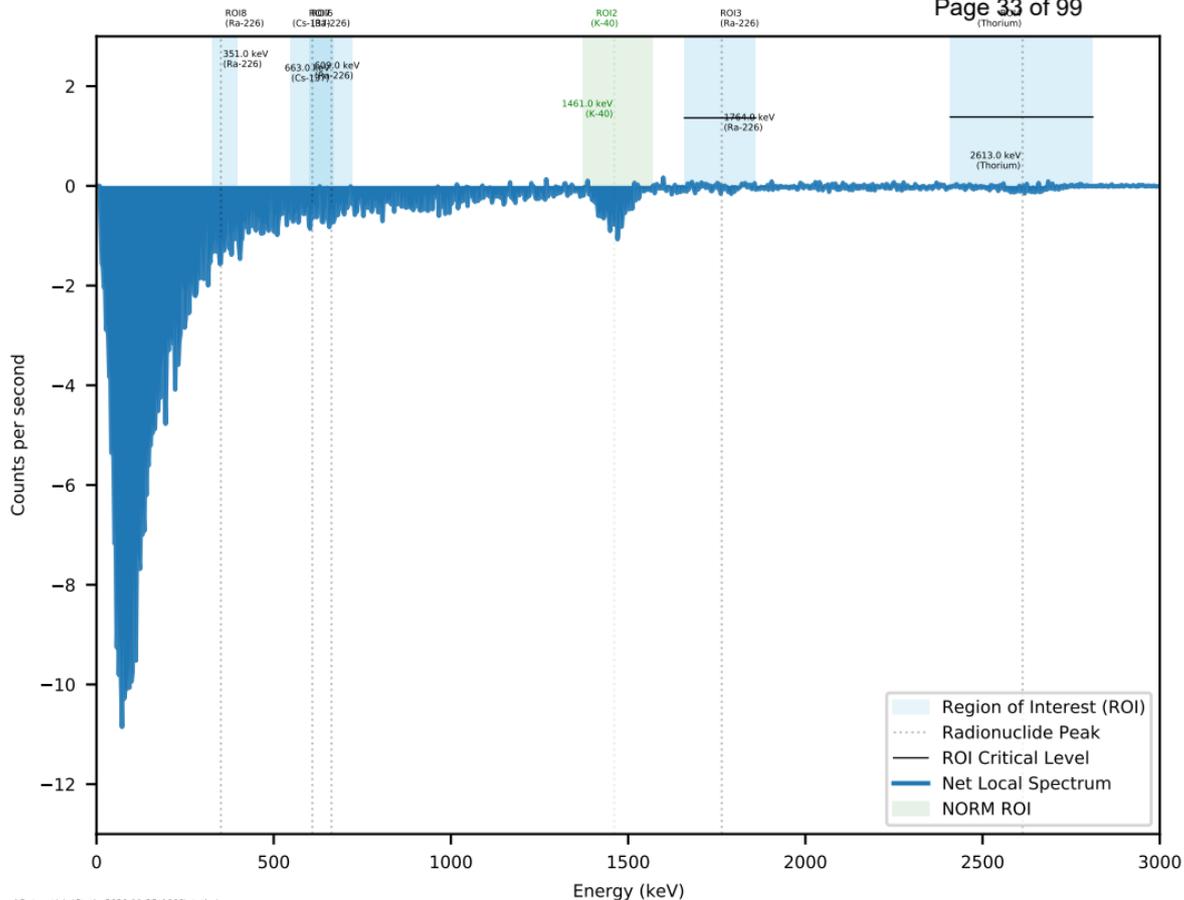


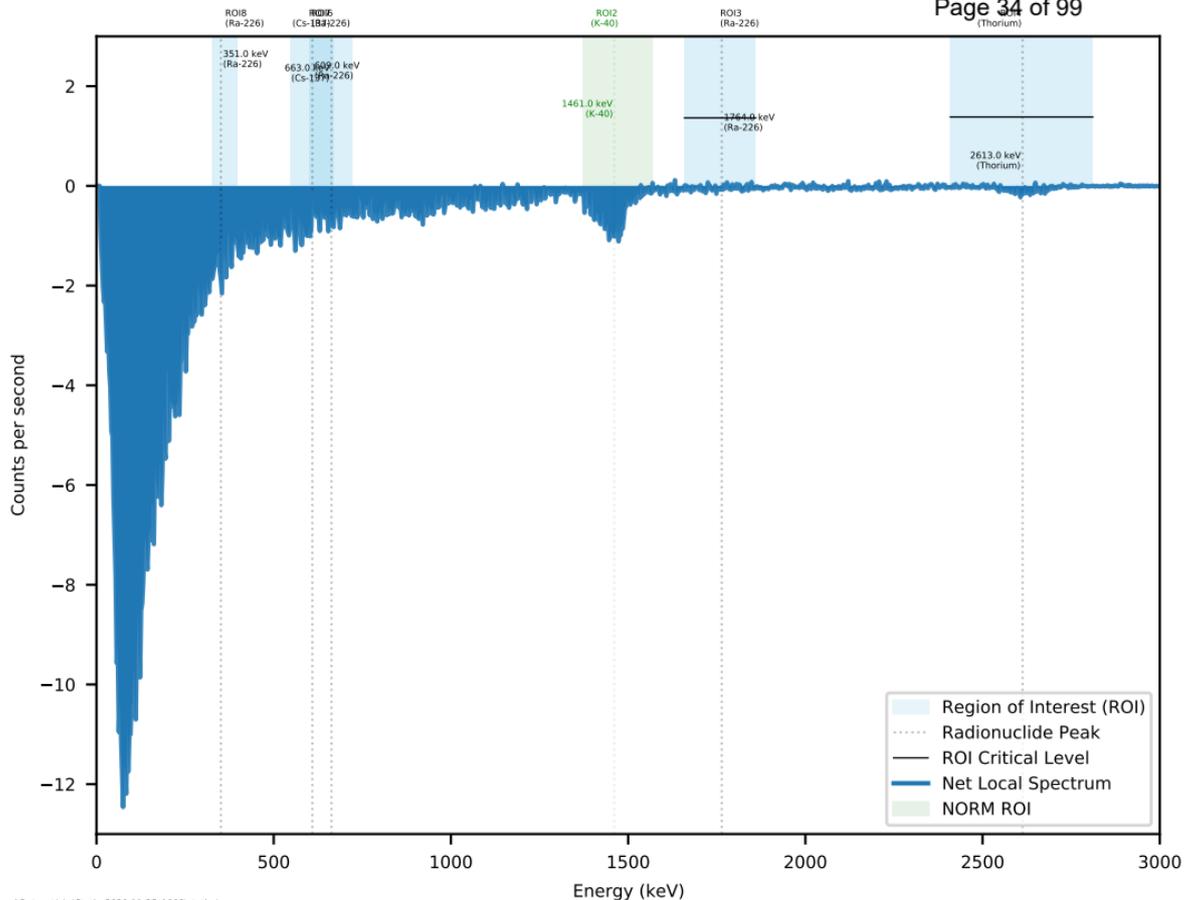


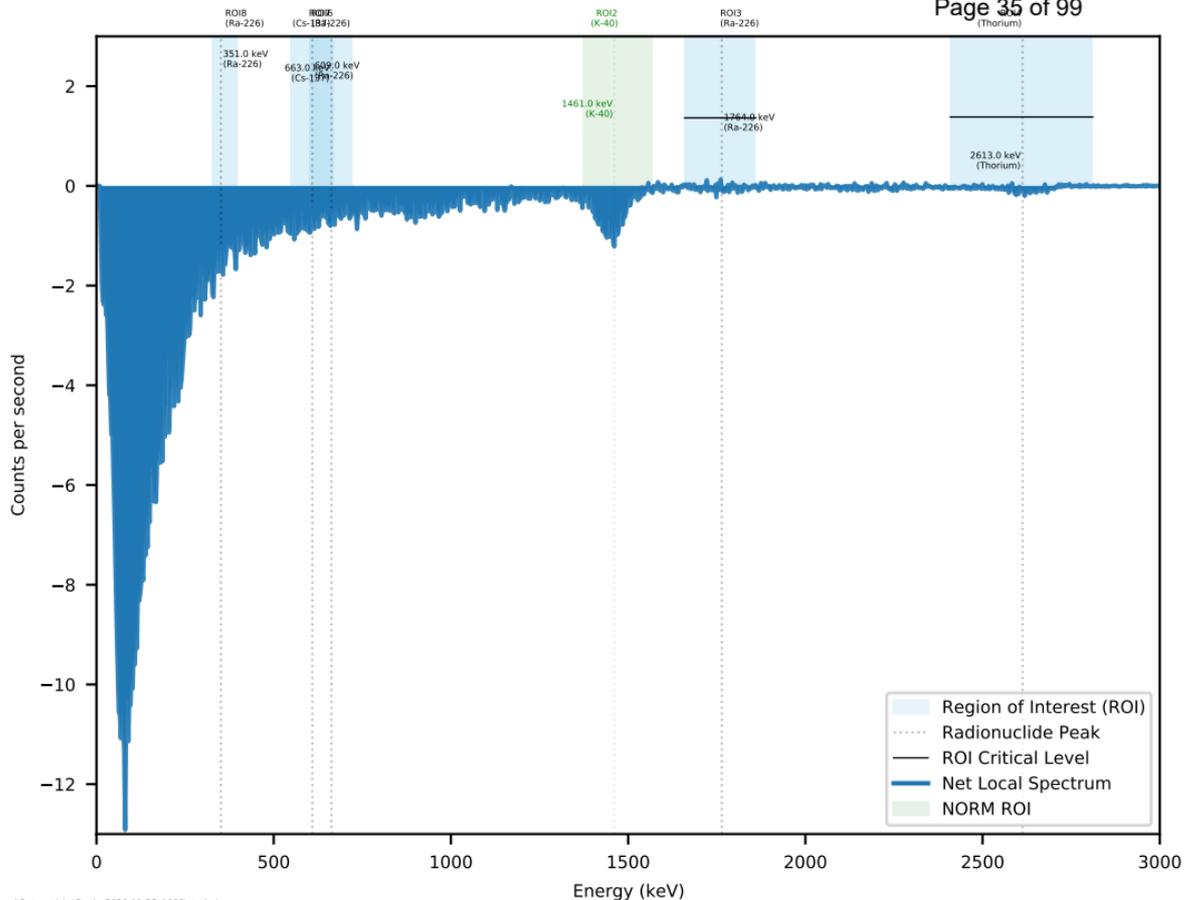


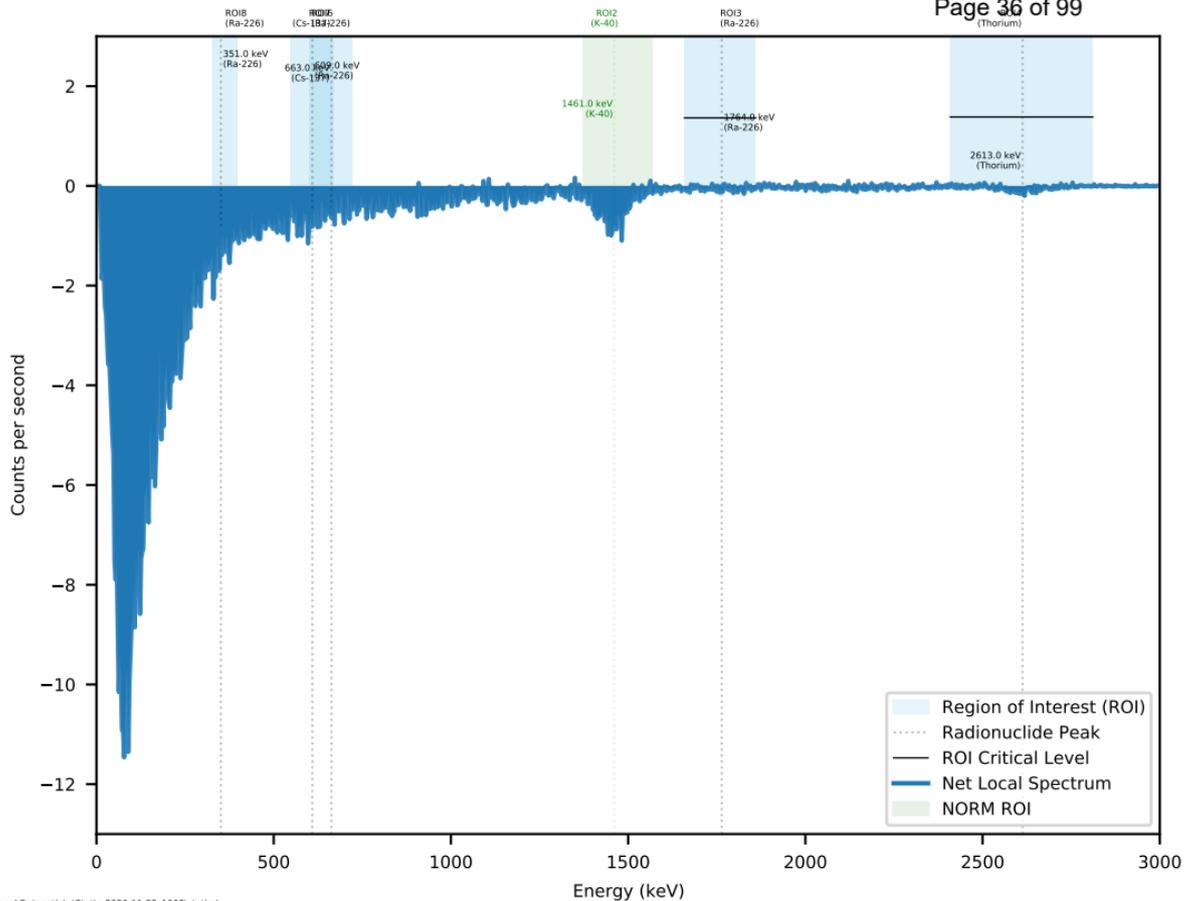


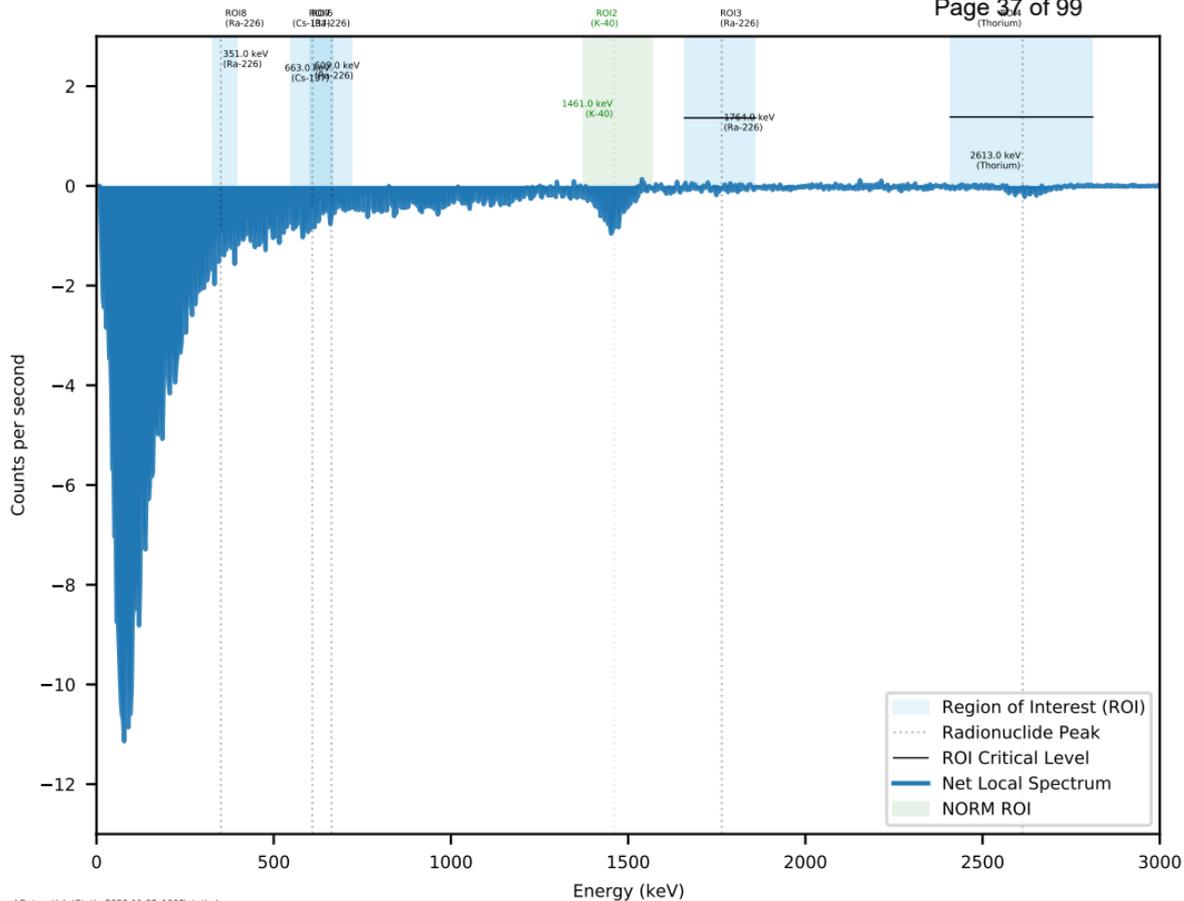


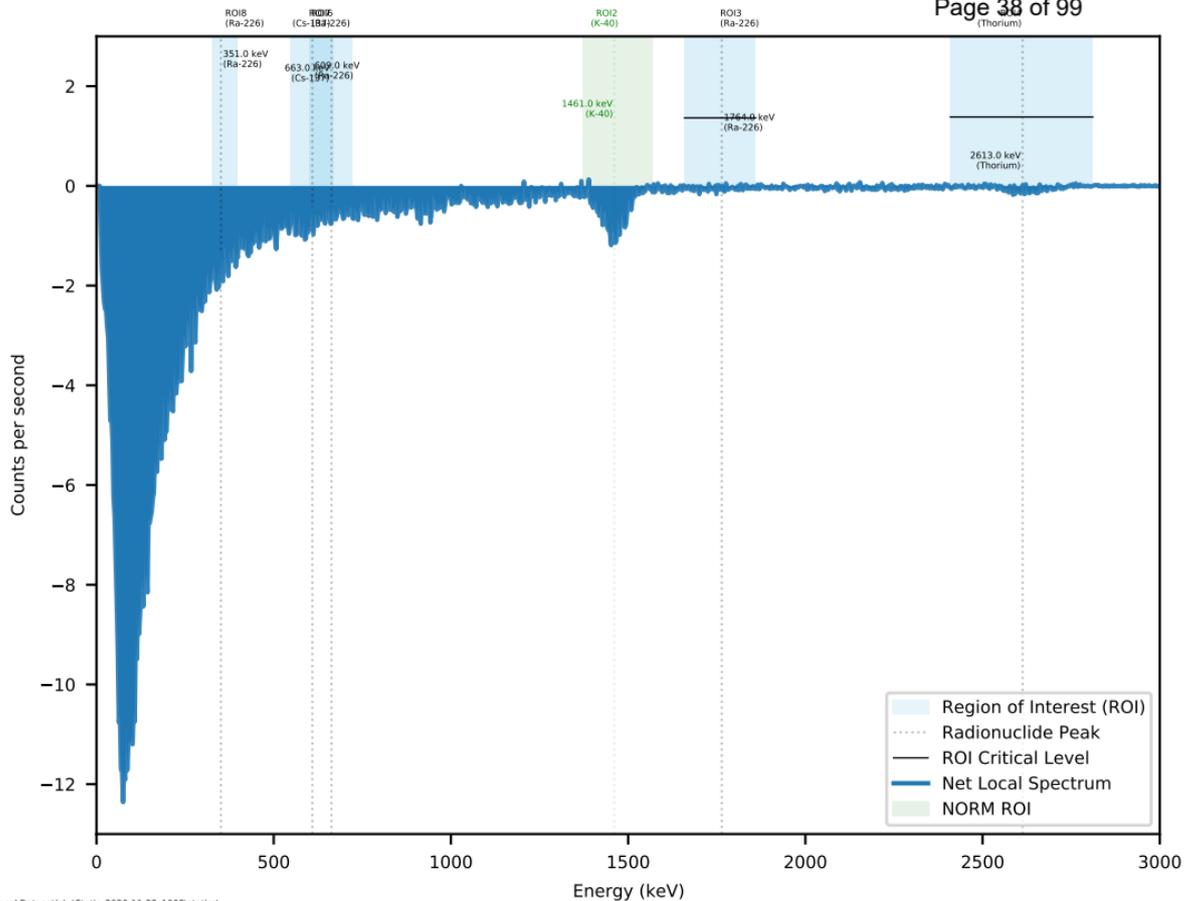


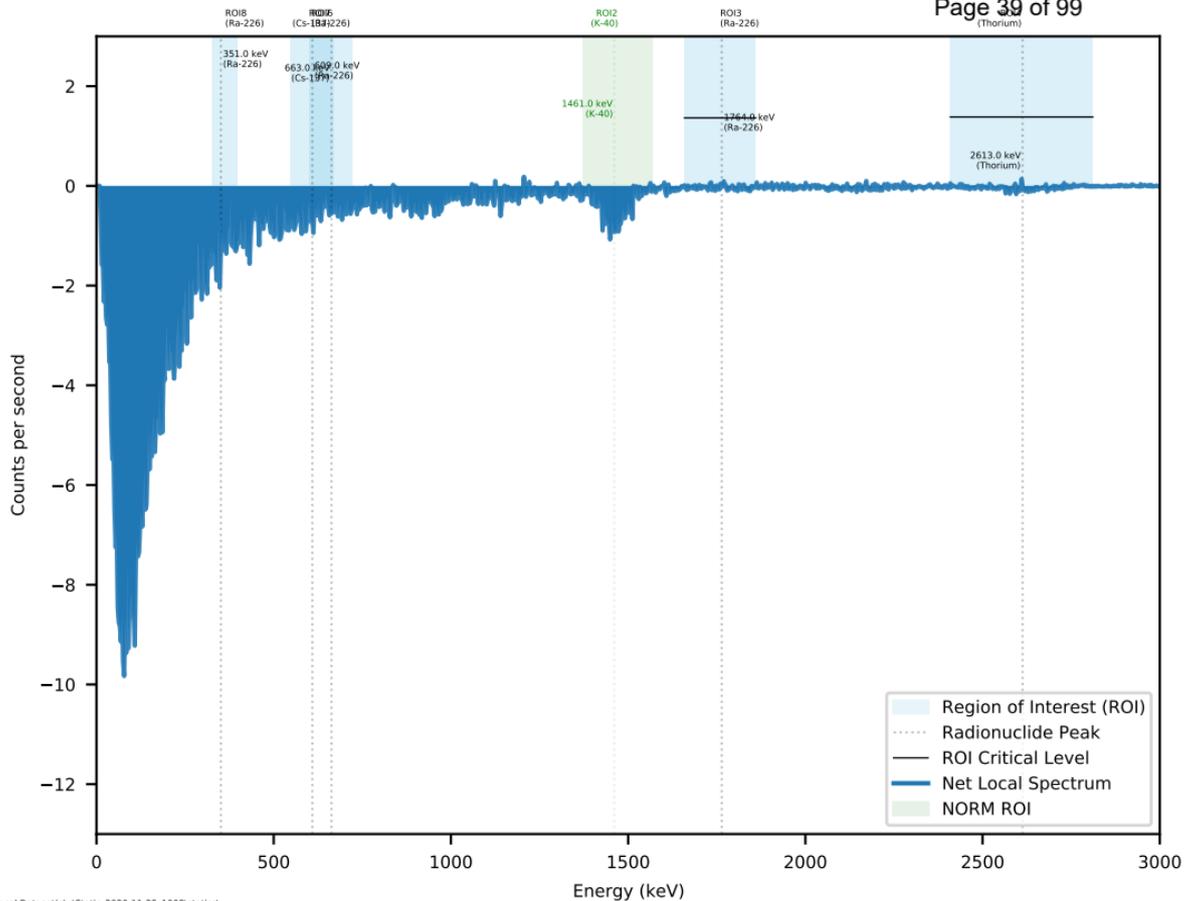


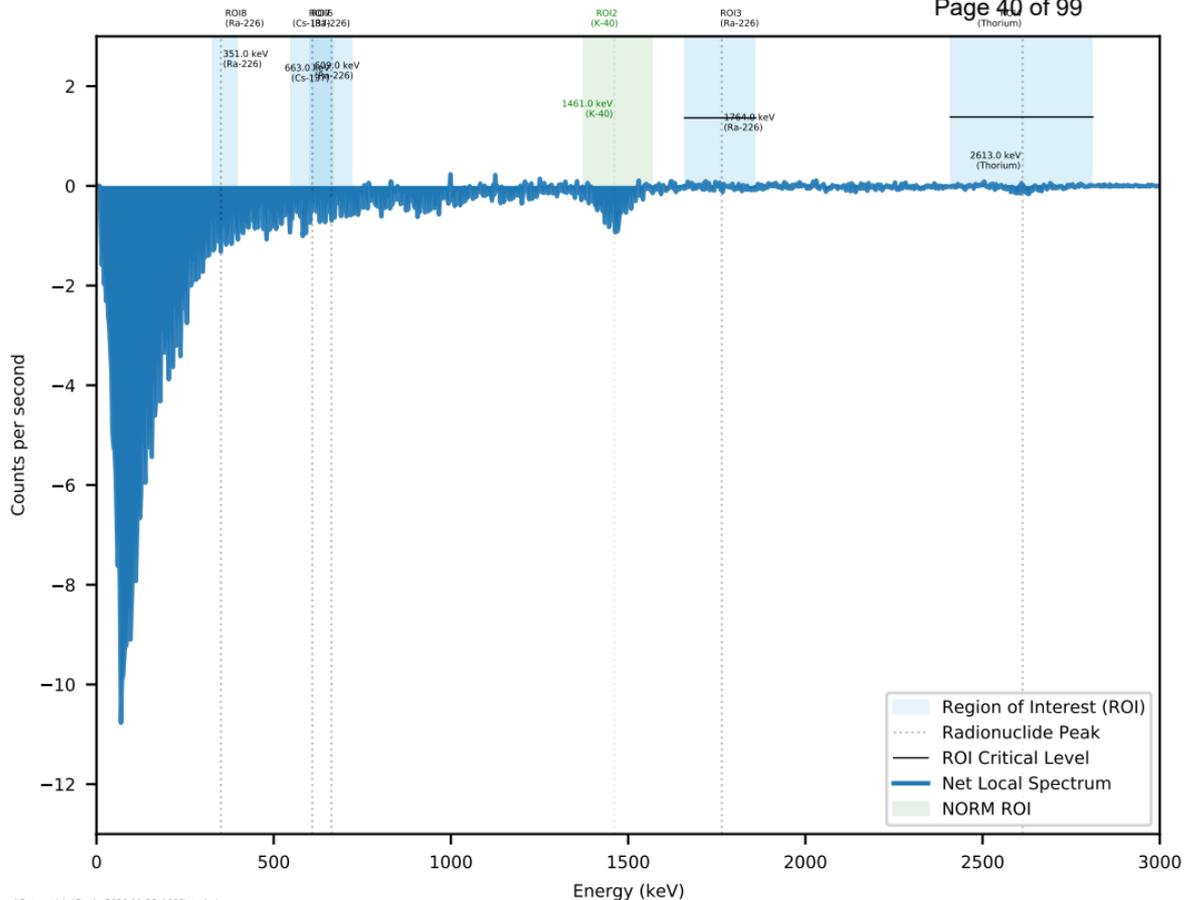


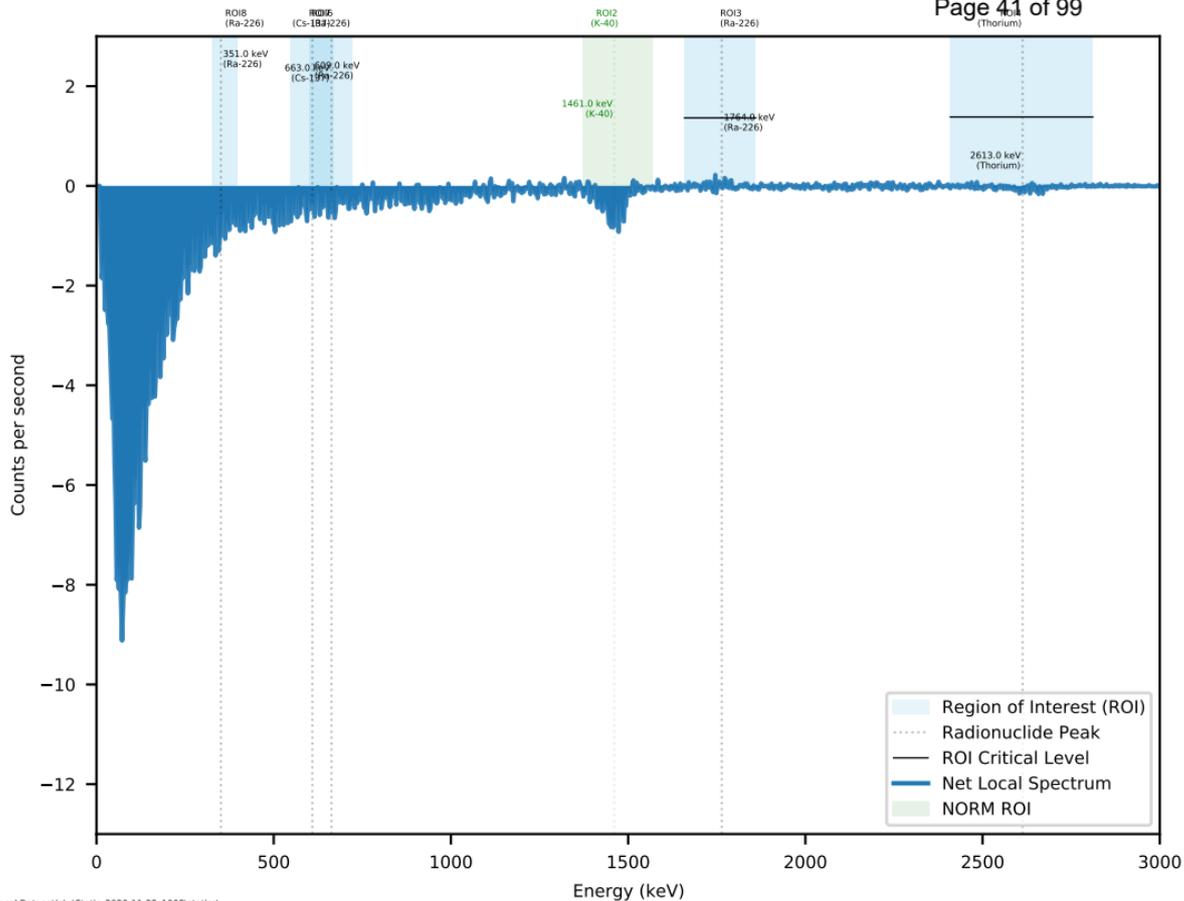


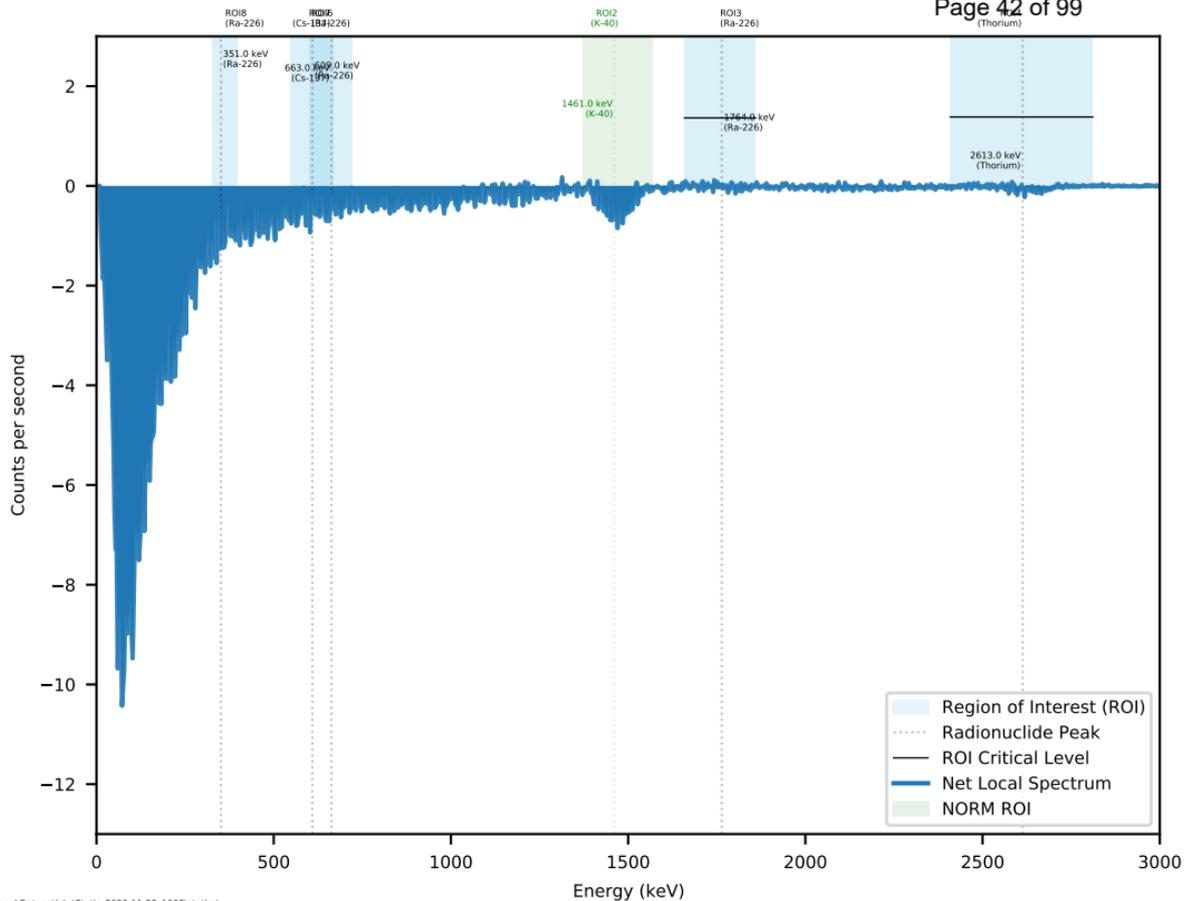


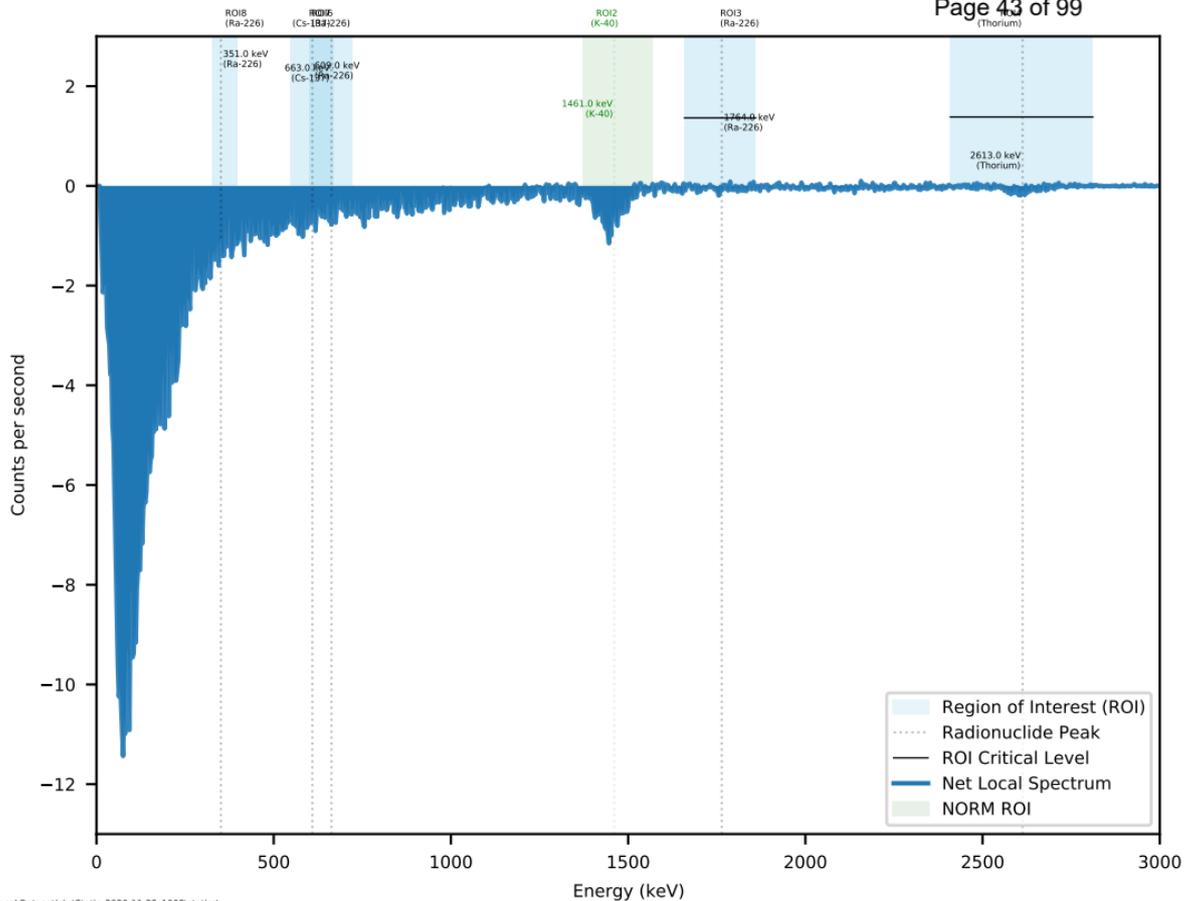


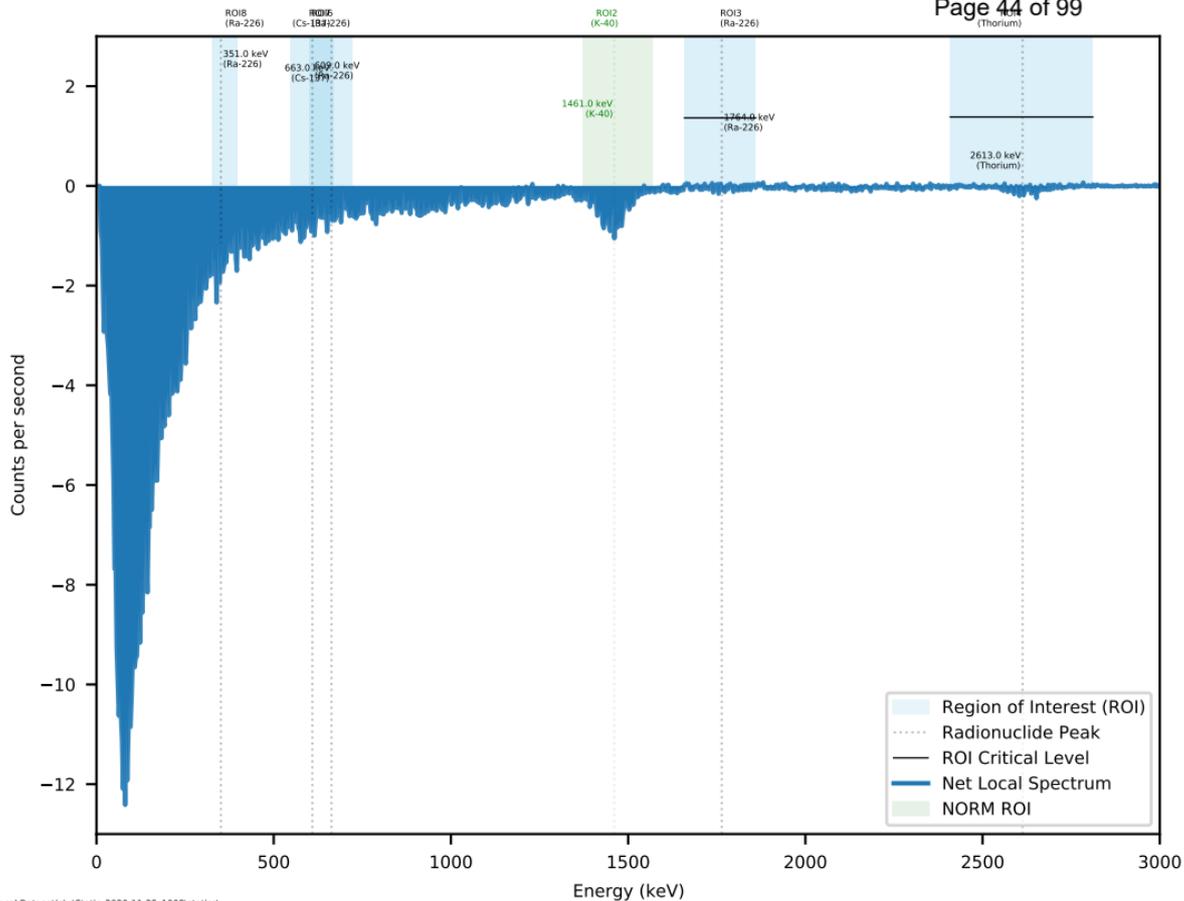


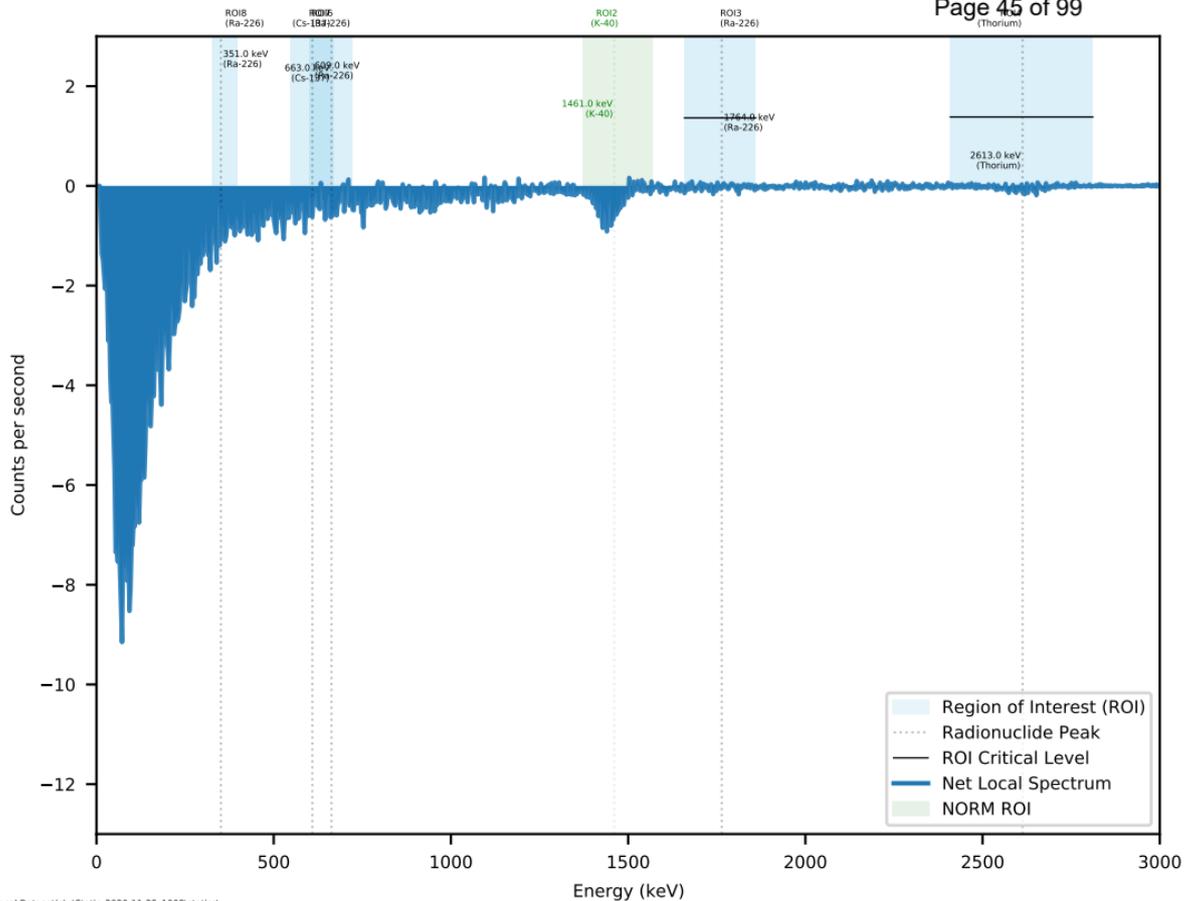














Environment Testing
America

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40595-1
Laboratory Sample Delivery Group: GJ46599744
Client Project/Site: HPNS-Parcel G 501197
Revision: 2

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/14/2021 2:49:43 PM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@Eurofinset.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Case Narrative

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
SDG: GJ46599744

Job ID: 160-40595-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40595-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved, Detailed information can be found in the most current revision of the associated SOP.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Updated isotopic thorium to report DLC.

Revision 2- Additional information requested in case narrative for total strontium

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
SDG: GJ46599744

Job ID: 160-40595-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

RECEIPT

The samples were received on 11/27/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 16.1 C.

STRONTIUM-90 (GFPC)

Samples HPPG-F-047 (160-40595-1), HPPG-SFU-TU107A-001 (160-40595-3), HPPG-SFU-TU107A-011 (160-40595-13) and HPPG-SFU-TU107A-021 (160-40595-23) were analyzed for Strontium-90 (GFPC) in accordance with EPA 905. The samples were dried on 12/01/2020, prepared on 12/09/2020 and analyzed on 12/18/2020.

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-F-047 (160-40595-1), HPPG-SFU-TU107A-001 (160-40595-3), HPPG-SFU-TU107A-011 (160-40595-13) and HPPG-SFU-TU107A-021 (160-40595-23).

The method blank (MB) z-score is within limits and is stored in the level IV raw data. (MB 160-491323/23-A)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Samples HPPG-F-047 (160-40595-1), HPPG-SFU-TU107A-001 (160-40595-3), HPPG-SFU-TU107A-011 (160-40595-13) and HPPG-SFU-TU107A-021 (160-40595-23) were analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with DOE A01R_Th. The samples were dried on 12/01/2020, prepared on 12/15/2020 and analyzed on 12/30/2020.

A blank population correction was applied to account for contributions to the analyte count rate from sources other than the sample itself. Interferences may include, but are not limited to, impurities in reagents, tracers, or glassware, or effects due to the measurement process (such as tailing or crosstalk). HPPG-F-047 (160-40595-1), HPPG-SFU-TU107A-001 (160-40595-3), HPPG-SFU-TU107A-011 (160-40595-13), HPPG-SFU-TU107A-021 (160-40595-23), (LCS 160-491944/2-A), (MB 160-491944/1-A) and (160-40595-A-1-E DU)

Results for the method blank (MB) are negative more than 3 times the 1 total propagated uncertainty (TPU). This appears to be random in nature, and does not affect the sample results. The magnitude of the negative results is minimal compared to the client sample results. The laboratory does not believe this excursion adversely affects the data. (MB 160-491944/1-A)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Samples HPPG-F-047 (160-40595-1), HPPG-F-048 (160-40595-2), HPPG-SFU-TU107A-001 (160-40595-3), HPPG-SFU-TU107A-002 (160-40595-4), HPPG-SFU-TU107A-003 (160-40595-5), HPPG-SFU-TU107A-004 (160-40595-6), HPPG-SFU-TU107A-005 (160-40595-7), HPPG-SFU-TU107A-006 (160-40595-8), HPPG-SFU-TU107A-007 (160-40595-9), HPPG-SFU-TU107A-008 (160-40595-10), HPPG-SFU-TU107A-009 (160-40595-11), HPPG-SFU-TU107A-010 (160-40595-12), HPPG-SFU-TU107A-011 (160-40595-13), HPPG-SFU-TU107A-012 (160-40595-14), HPPG-SFU-TU107A-013 (160-40595-15), HPPG-SFU-TU107A-014 (160-40595-16), HPPG-SFU-TU107A-015 (160-40595-17), HPPG-SFU-TU107A-016 (160-40595-18), HPPG-SFU-TU107A-017 (160-40595-19), HPPG-SFU-TU107A-018 (160-40595-20), HPPG-SFU-TU107A-019 (160-40595-21), HPPG-SFU-TU107A-020 (160-40595-22), HPPG-SFU-TU107A-021 (160-40595-23), HPPG-SFU-TU107A-022 (160-40595-24), HPPG-SFU-TU107A-023 (160-40595-25), HPPG-SFU-TU107A-024 (160-40595-26) and HPPG-SFU-TU107A-025 (160-40595-27) were analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 12/01/2020, prepared on 12/03/2020 and analyzed on 12/24/2020 and 12/30/2020.

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from	Reported to Analyte
Th-234	Pa-234
Th-234	U-238

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Job ID: 160-40595-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m
Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

Gamma Prep Batch 490806

The replicate precision (RER) for Th-234/U-238 does not meet QC criteria. This appears to be random in nature, and limited deviations such as this are statistically expected when larger analyte lists are reported. Such excursions are often caused by fluctuations in Compton background, force-fitting of peaks that are not found by the software peak-search algorithm, and inclusion of inferior peak results by the software in weighted averages. The laboratory SOP allows for such statistical exceedances.(160-40595-A-5-C DU)

The method blank (MB) z-score associated with Prep Batch 160-490806 is within limits and is stored in the level IV raw data. (MB 160-490806/1-A)

Gamma prep batch 490802

The method blank (MB) z-score associated with Prep Batch 160-490802 is within limits and is stored in the level IV raw data. (MB 160-490802/1-A)

Gamma prep batch 490812

The method blank (MB) z-score associated with Prep Batch 160-490812 is within limits and is stored in the level IV raw data. (MB 160-490812/1-A)

The radium-226 detection goal of 0.200 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. HPPG-SFU-TU107A-010 (160-40595-12)

The replicate precision for Ac-228/Ra-228/Th-232 associated with Prep Batch 160-490616 and 160-490812 does not meet QC criteria. This appears to be random in nature, and limited deviations such as this are statistically expected when larger analyte lists are reported. Such excursions are often caused by fluctuations in Compton background, force-fitting of peaks that are not found by the software peak-search algorithm, and inclusion of inferior peak results by the software in weighted averages. The laboratory SOP allows for such statistical exceedances. (160-40595-A-25-C DU)

The cesium-137 detection goal of 0.0700 pCi/g was not met. This is caused by statistical fluctuations in the Compton background due to low level activity in the samples in conjunction with the software attempting to fit a peak into the noise of this baseline. HPPG-SFU-TU107A-005 (160-40595-7) and HPPG-SFU-TU107A-006 (160-40595-8)

The following sample exhibited a negative result greater in magnitude than the 3 sigma TPU for Bi-214: (LCS 160-490812/2-A). This occurrence was evaluated and determined to be random in nature. Sporadic occurrences such as this are statistically expected. No further action is required.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.



CHAIN OF CUSTODY

Ref. Document # 501197RSY-045

APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy

Sample Lead: Lewis, Devin

Sample Tech(s): Paul LeBlanc

Project Number: 501197
 Project Name: Hunters Point Naval Shipyard; Parcel G Remedial Action
 Project Location: San Francisco, CA
 Purchase Order #: 1159058
 Shipment/Pickup Date: 11/25/2020
 Waybill Number: 4957 0225 6056
 Lab Destination: Test America (St. Louis Lab)
 13715 Rider Trail North
 Earth City, MO 63046

Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

Matrix	# of Containers	Preservatives (water)	Preservatives (soil)	Container Type	Analysis Requested			Dose Rate uR/Hr	Evidence Bag ID	Comment
					Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma	Strontium-90 (EPA 905 MOD)	Isotopic Th(228, 230, 232)			



Page 6 of 38

Sample ID	Collection Information			Matrix	# of Containers	Container Type	X	X	X	4	GJ46599744		
	Date	Time	Method										
HPPG-F-047	11/24/2020	13:32	G	SO	1	16 oz. plastic jar	X				4	GJ46599744	
HPPG-F-048	11/24/2020	13:50	G	SO	1	16 oz. plastic jar	X				4	GJ46599744	
HPPG-SFU-TU107A-001	11/24/2020	13:16	G	SO	1	16 oz. plastic jar	X		X		4	GJ46599744	
HPPG-SFU-TU107A-002	11/24/2020	13:18	G	SO	1	16 oz. plastic jar	X				4	GJ46599744	
HPPG-SFU-TU107A-003	11/24/2020	13:20	G	SO	1	16 oz. plastic jar	X				4	GJ46599744	
HPPG-SFU-TU107A-004	11/24/2020	13:22	G	SO	1	16 oz. plastic jar	X				4	GJ46599744	
HPPG-SFU-TU107A-005	11/24/2020	13:23	G	SO	1	16 oz. plastic jar	X				4	GJ46599744	
HPPG-SFU-TU107A-006	11/24/2020	13:20	G	SO	1	16 oz. plastic jar	X				4	GJ46599744	

Special Instructions: 21 day in growth results only

Turanaround Time: 3-day 10-Day 28-day Other

Level of QC Required: I II III Project Specific

Method Codes C = Composite G = Grab Matrix Codes: DW = Drinking Water; So = Soil; GW = Ground Water; SL = Sludge; WW = Waste Water; CP = Chip Samples; A = Air; ABS = Asbestos; PO = Pipe Opening

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin		11/24/2020 17:00	Locked Storage(Kevin Hoch)		11/24/2020 17:00
Locked Storage(Kevin Hoch)		11/25/2020 07:39	Devin Lewis		11/25/2020 07:39
Devin Lewis		11/25/2020 11:09	SHIPPEDTOLAB		11/25/2020 09:12

*** Last 3 transfers shown above - Complete list of transfers on last page ***



4/14/2021 (Rev. 2)



APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin

Sample Tech(s): Paul LeBlanc

CHAIN OF CUSTODY

Ref. Document # 501197RSY-045

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 11/25/2020
Waybill Number: 4957 0225 6056
Lab Destination: Test America (St. Louis Lab)
13715 Rider Trail North
Earth City, MO 63046

Lab Contact Name/ph #: Rhoeda Ridenbower (314)298-8566

Sample ID	Collection Information			Matrix	# of Containers	Container Type	Analysis Requested					Dose Rate uR/Hr	Evidence Bag ID	Comment	
	Date	Time	Method				Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma	Strontium-90 (EPA 905 MOD)	Isotopic Th(228, 230, 232)						
						Preservatives (water)									
						Preservatives (soil)									
HPPG-SFU-TU107A-007	11/24/2020	13:32	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-008	11/24/2020	13:24	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-009	11/24/2020	13:26	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-010	11/24/2020	13:28	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-011	11/24/2020	13:32	G	SO	1	16 oz. plastic jar	X	X		X		4	GJ46599744		
HPPG-SFU-TU107A-012	11/24/2020	13:35	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-013	11/24/2020	13:34	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-014	11/24/2020	13:37	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-015	11/24/2020	13:40	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-016	11/24/2020	13:43	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-017	11/24/2020	13:44	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-018	11/24/2020	13:46	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-019	11/24/2020	13:42	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-020	11/24/2020	13:47	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-021	11/24/2020	13:46	G	SO	1	16 oz. plastic jar	X	X		X		4	GJ46599744		
HPPG-SFU-TU107A-022	11/24/2020	13:50	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		
HPPG-SFU-TU107A-023	11/24/2020	13:52	G	SO	1	16 oz. plastic jar	X					4	GJ46599744		





CHAIN OF CUSTODY

Ref. Document # 501197RSY-045

APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy
City: Concord, CA 94520

Sample Lead: Lewis, Devin

Sample Tech(s): Paul LeBlanc

Project Number: 501197
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action
Project Location: San Francisco, CA
Purchase Order #: 1159058
Shipment/Pickup Date: 11/25/2020
Waybill Number: 4957 0225 8056
Lab Destination: Test America (St. Louis Lab)
13715 Rider Trail North
Earth City, MO 63046

Lab Contact Name/ph # Rhoeda Ridenbower (314)298-8566

		Analysis Requested					Dose Rate uR/Hr	Evidence Bag ID	Comment					
Matrix	# of Containers	Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma	Strontium-90 (EPA 905 MOD)	Isotopic Th(228, 230, 232)										
		Preservatives (water)												
		Preservatives (soil)												
		Container Type												
		HPPG-SFU-TU107A-024	11/24/2020	13:54	G	SO	1	16 oz. plastic jar	X			4	GJ46599744	
		HPPG-SFU-TU107A-025	11/24/2020	13:55	G	SO	1	16 oz. plastic jar	X			4	GJ46599744	

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4/14/2021 (Rev. 2)



All Transfers for COC 501197RSY-045

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Lewis, Devin	<i>[Signature]</i>	11/24/2020 17:00	Locked Storage(Kevin Hoch)	<i>[Signature]</i>	11/24/2020 17:00
Locked Storage(Kevin Hoch)	<i>[Signature]</i>	11/25/2020 07:39	Devin Lewis	<i>[Signature]</i>	11/25/2020 07:39
Devin Lewis	<i>[Signature]</i>	11/25/2020 11:09	SHIPPEDTOLAB	<i>[Signature]</i>	11/27/2020 09:12

MICHA KORRINZER



Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40595-1

SDG Number: GJ46599744

Login Number: 40595**List Source: Eurofins TestAmerica, St. Louis****List Number: 1****Creator: Greer, Diane A**

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
SDG: GJ46599744

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
SDG: GJ46599744

Method	Method Description	Protocol	Laboratory
905	Strontium-90 (GFPC)	EPA	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-7	Preparation, Digestion/Precipitate Separation (7-Day In-Growth)	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

- DOE = U.S. Department of Energy
- EPA = US Environmental Protection Agency
- None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



Sample Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
SDG: GJ46599744

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40595-1	HPPG-F-047	Solid	11/24/20 13:32	11/27/20 09:12	
160-40595-2	HPPG-F-048	Solid	11/24/20 13:50	11/27/20 09:12	
160-40595-3	HPPG-SFU-TU107A-001	Solid	11/24/20 13:16	11/27/20 09:12	
160-40595-4	HPPG-SFU-TU107A-002	Solid	11/24/20 13:18	11/27/20 09:12	
160-40595-5	HPPG-SFU-TU107A-003	Solid	11/24/20 13:20	11/27/20 09:12	
160-40595-6	HPPG-SFU-TU107A-004	Solid	11/24/20 13:22	11/27/20 09:12	
160-40595-7	HPPG-SFU-TU107A-005	Solid	11/24/20 13:23	11/27/20 09:12	
160-40595-8	HPPG-SFU-TU107A-006	Solid	11/24/20 13:20	11/27/20 09:12	
160-40595-9	HPPG-SFU-TU107A-007	Solid	11/24/20 13:32	11/27/20 09:12	
160-40595-10	HPPG-SFU-TU107A-008	Solid	11/24/20 13:24	11/27/20 09:12	
160-40595-11	HPPG-SFU-TU107A-009	Solid	11/24/20 13:26	11/27/20 09:12	
160-40595-12	HPPG-SFU-TU107A-010	Solid	11/24/20 13:28	11/27/20 09:12	
160-40595-13	HPPG-SFU-TU107A-011	Solid	11/24/20 13:32	11/27/20 09:12	
160-40595-14	HPPG-SFU-TU107A-012	Solid	11/24/20 13:35	11/27/20 09:12	
160-40595-15	HPPG-SFU-TU107A-013	Solid	11/24/20 13:34	11/27/20 09:12	
160-40595-16	HPPG-SFU-TU107A-014	Solid	11/24/20 13:37	11/27/20 09:12	
160-40595-17	HPPG-SFU-TU107A-015	Solid	11/24/20 13:40	11/27/20 09:12	
160-40595-18	HPPG-SFU-TU107A-016	Solid	11/24/20 13:43	11/27/20 09:12	
160-40595-19	HPPG-SFU-TU107A-017	Solid	11/24/20 13:44	11/27/20 09:12	
160-40595-20	HPPG-SFU-TU107A-018	Solid	11/24/20 13:46	11/27/20 09:12	
160-40595-21	HPPG-SFU-TU107A-019	Solid	11/24/20 13:42	11/27/20 09:12	
160-40595-22	HPPG-SFU-TU107A-020	Solid	11/24/20 13:47	11/27/20 09:12	
160-40595-23	HPPG-SFU-TU107A-021	Solid	11/24/20 13:46	11/27/20 09:12	
160-40595-24	HPPG-SFU-TU107A-022	Solid	11/24/20 13:50	11/27/20 09:12	
160-40595-25	HPPG-SFU-TU107A-023	Solid	11/24/20 13:52	11/27/20 09:12	
160-40595-26	HPPG-SFU-TU107A-024	Solid	11/24/20 13:54	11/27/20 09:12	
160-40595-27	HPPG-SFU-TU107A-025	Solid	11/24/20 13:55	11/27/20 09:12	

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-F-047

Lab Sample ID: 160-40595-1

Date Collected: 11/24/20 13:32

Matrix: Solid

Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	0.175		0.166	0.167	0.331	0.124	pCi/g	12/09/20 18:42	12/18/20 20:07	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	99.7		40 - 110					12/09/20 18:42	12/18/20 20:07	1
Y Carrier	95.3		40 - 110					12/09/20 18:42	12/18/20 20:07	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.426		0.0711	0.0796	0.250	0.0278	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.321		0.0670	0.0722	0.250	0.0257	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.403		0.0591	0.0681	0.250	0.00800	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	81.3		30 - 110					12/15/20 14:37	12/30/20 10:45	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.443		0.168	0.174		0.0350	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Actinium-227	0.167	U	0.331	0.332		0.369	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Bismuth-212	-0.312	U	0.879	0.880		0.696	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Bismuth-214	-0.0542	U	0.143	0.143		0.175	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Cesium-137	-0.0516	U	0.0835	0.0837	0.0700	0.0648	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Lead-210	0.0901	U	1.80	1.80		1.47	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Lead-212	0.278		0.0986	0.105		0.0633	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Lead-214	0.450		0.128	0.136		0.0667	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Potassium-40	9.44		1.55	1.82		0.260	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Protactinium-231	0.515	U	1.79	1.79		1.96	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Protactinium-234	-0.138	U	0.366	0.366		0.298	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Radium-226	-0.0542	U	0.143	0.143	0.200	0.175	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Radium-228	0.443		0.168	0.174		0.0350	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Thallium-208	0.111		0.0877	0.0884		0.0344	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Thorium 228	0.278		0.0986	0.105		0.0633	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Thorium-232	0.443		0.168	0.174		0.0350	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Thorium-234	-0.445	U	0.856	0.858		1.02	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Uranium-235	0.180	U	0.535	0.535		0.509	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Uranium-238	-0.445	U	0.856	0.858		1.02	pCi/g	12/03/20 12:24	12/24/20 07:16	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-F-048

Lab Sample ID: 160-40595-2

Date Collected: 11/24/20 13:50

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.154	U	0.200	0.201		0.162	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Actinium-227	0.178	U	0.487	0.487		0.292	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Bismuth-212	0.249	U	0.467	0.468		0.336	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Bismuth-214	0.0381	U	0.0492	0.0494		0.156	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Cesium-137	-0.0158	U	0.0815	0.0816	0.0700	0.0684	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Lead-210	-0.244	U	1.18	1.18		0.858	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Lead-212	0.161		0.0674	0.0705		0.0388	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Lead-214	0.194		0.102	0.104		0.0591	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Potassium-40	6.59		1.35	1.51		0.256	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Protactinium-231	-0.702	U	1.96	1.96		1.58	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Protactinium-234	-0.0760	U	0.197	0.197		0.158	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Radium-226	0.0381	U	0.0492	0.0494	0.200	0.156	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Radium-228	0.154	U	0.200	0.201		0.162	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Thallium-208	0.0465		0.0671	0.0673		0.0338	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Thorium 228	0.161		0.0674	0.0705		0.0388	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Thorium-232	0.154	U	0.200	0.201		0.162	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Thorium-234	0.336		0.399	0.401		0.319	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Uranium-235	0.0825	U	0.235	0.235		0.165	pCi/g	12/03/20 11:24	12/24/20 12:20	1
Uranium-238	0.336		0.399	0.401		0.319	pCi/g	12/03/20 11:24	12/24/20 12:20	1

Client Sample ID: HPPG-SFU-TU107A-001

Lab Sample ID: 160-40595-3

Date Collected: 11/24/20 13:16

Matrix: Solid

Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Strontium-90	-0.0190	U	0.116	0.116	0.331	0.0976	pCi/g	12/09/20 18:42	12/18/20 20:07	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	98.5		40 - 110					12/09/20 18:42	12/18/20 20:07	1
Y Carrier	95.7		40 - 110					12/09/20 18:42	12/18/20 20:07	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Thorium-228	0.513		0.0745	0.0861	0.250	0.0200	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.428		0.0754	0.0835	0.250	0.0257	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.612		0.0754	0.0912	0.250	0.00985	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	76.6		30 - 110					12/15/20 14:37	12/30/20 10:45	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-001

Lab Sample ID: 160-40595-3

Date Collected: 11/24/20 13:16

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.212		0.277	0.278		0.170	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Actinium-227	0.129	U	0.449	0.449		0.369	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Bismuth-212	0.429	U	0.698	0.700		0.525	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Bismuth-214	0.188	U	0.123	0.125		0.198	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Cesium-137	0.0396	U	0.0687	0.0689	0.0700	0.0528	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Lead-210	0.753	U	1.41	1.42		0.988	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Lead-212	0.601		0.108	0.129		0.0468	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Lead-214	0.366		0.118	0.125		0.0537	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Potassium-40	9.29		1.50	1.84		0.301	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Protactinium-231	0.649	U	2.36	2.36		2.44	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Protactinium-234	0.126	U	0.215	0.215		0.291	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Radium-226	0.188	U	0.123	0.125	0.200	0.198	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Radium-228	0.212		0.277	0.278		0.170	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Thallium-208	0.217		0.0727	0.0769		0.0278	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Thorium 228	0.601		0.108	0.129		0.0468	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Thorium-232	0.212		0.277	0.278		0.170	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Thorium-234	0.601		0.658	0.662		0.508	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Uranium-235	-0.0228	U	0.352	0.352		0.500	pCi/g	12/03/20 11:24	12/24/20 12:50	1
Uranium-238	0.601		0.658	0.662		0.508	pCi/g	12/03/20 11:24	12/24/20 12:50	1

Client Sample ID: HPPG-SFU-TU107A-002

Lab Sample ID: 160-40595-4

Date Collected: 11/24/20 13:18

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.452		0.127	0.135		0.0629	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Actinium-227	0.140	U	0.374	0.375		0.216	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Bismuth-212	0.220	U	0.466	0.466		0.362	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Bismuth-214	0.338		0.100	0.106		0.0430	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Cesium-137	0.0146	U	0.0505	0.0505	0.0700	0.0405	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Lead-210	0.518	U	1.00	1.01		0.800	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Lead-212	0.372		0.0650	0.0809		0.0259	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Lead-214	0.375		0.0931	0.101		0.0383	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Potassium-40	8.79		1.09	1.41		0.0785	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Protactinium-231	0.527	U	1.70	1.70		1.38	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Protactinium-234	0.105	U	0.182	0.183		0.175	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Radium-226	0.338		0.100	0.106	0.200	0.0430	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Radium-228	0.452		0.127	0.135		0.0629	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Thallium-208	0.133		0.0413	0.0435		0.0132	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Thorium 228	0.372		0.0650	0.0809		0.0259	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Thorium-232	0.452		0.127	0.135		0.0629	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Thorium-234	0.257	U	0.844	0.845		0.689	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Uranium-235	-0.162	U	0.441	0.441		0.359	pCi/g	12/03/20 11:24	12/24/20 11:56	1
Uranium-238	0.257	U	0.844	0.845		0.689	pCi/g	12/03/20 11:24	12/24/20 11:56	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-003

Lab Sample ID: 160-40595-5

Date Collected: 11/24/20 13:20

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.216		0.288	0.289		0.181	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Actinium-227	0.0423	U	0.0745	0.0747		0.435	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Bismuth-212	0.362	U	0.830	0.831		0.647	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Bismuth-214	0.272		0.150	0.153		0.0768	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Cesium-137	-0.0299	U	0.0633	0.0634	0.0700	0.0488	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Lead-210	1.34		1.50	1.51		1.02	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Lead-212	0.387		0.0951	0.105		0.0468	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Lead-214	0.387		0.136	0.143		0.0623	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Potassium-40	8.86		1.66	1.94		0.450	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Protactinium-231	0.000	U	0.380	0.380		2.44	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Protactinium-234	-0.125	U	0.373	0.373		0.304	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Radium-226	0.272		0.150	0.153	0.200	0.0768	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Radium-228	0.216		0.288	0.289		0.181	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Thallium-208	0.190		0.0592	0.0631		0.0179	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Thorium 228	0.387		0.0951	0.105		0.0468	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Thorium-232	0.216		0.288	0.289		0.181	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Thorium-234	-1.01	U	0.674	0.685		0.952	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Uranium-235	-0.0242	U	0.361	0.361		0.555	pCi/g	12/03/20 12:24	12/24/20 07:16	1
Uranium-238	-1.01	U	0.674	0.685		0.952	pCi/g	12/03/20 12:24	12/24/20 07:16	1

Client Sample ID: HPPG-SFU-TU107A-004

Lab Sample ID: 160-40595-6

Date Collected: 11/24/20 13:22

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.360		0.153	0.158		0.0405	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Actinium-227	-0.0222	U	0.0680	0.0681		0.370	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Bismuth-212	-0.00432	U	0.836	0.836		0.658	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Bismuth-214	0.196		0.128	0.129		0.0771	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Cesium-137	-0.0499	U	0.0799	0.0801	0.0700	0.0692	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Lead-210	0.508	U	0.998	1.00		0.703	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Lead-212	0.418		0.0868	0.102		0.0277	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Lead-214	0.342		0.123	0.128		0.0671	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Potassium-40	8.44		1.58	1.80		0.276	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Protactinium-231	0.000	U	0.654	0.654		2.11	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Protactinium-234	0.0334	U	0.0546	0.0547		0.197	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Radium-226	0.196		0.128	0.129	0.200	0.0771	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Radium-228	0.360		0.153	0.158		0.0405	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Thallium-208	0.152		0.0731	0.0748		0.0296	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Thorium 228	0.418		0.0868	0.102		0.0277	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Thorium-232	0.360		0.153	0.158		0.0405	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Thorium-234	0.261	U	0.519	0.520		0.409	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Uranium-235	-0.0894	U	0.279	0.279		0.303	pCi/g	12/03/20 13:12	12/24/20 07:53	1
Uranium-238	0.261	U	0.519	0.520		0.409	pCi/g	12/03/20 13:12	12/24/20 07:53	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-005

Lab Sample ID: 160-40595-7

Date Collected: 11/24/20 13:23

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.530		0.182	0.192		0.0363	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Actinium-227	-0.328	U	0.672	0.673		0.423	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Bismuth-212	0.458	U	0.854	0.856		0.657	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Bismuth-214	0.433		0.140	0.149		0.0549	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Cesium-137	0.00941	U	0.0889	0.0889	0.0700	0.0725	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Lead-210	1.63		1.51	1.52		0.966	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Lead-212	0.287		0.103	0.108		0.0501	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Lead-214	0.323		0.151	0.155		0.111	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Potassium-40	7.84		1.44	1.70		0.321	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Protactinium-231	0.713	U	2.12	2.12		2.32	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Protactinium-234	0.201		0.236	0.237		0.197	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Radium-226	0.433		0.140	0.149	0.200	0.0549	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Radium-228	0.530		0.182	0.192		0.0363	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Thallium-208	0.178		0.0591	0.0626		0.0180	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Thorium 228	0.287		0.103	0.108		0.0501	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Thorium-232	0.530		0.182	0.192		0.0363	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Thorium-234	1.06		0.691	0.703		0.456	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Uranium-235	0.199	U	0.391	0.391		0.392	pCi/g	12/03/20 13:12	12/24/20 07:52	1
Uranium-238	1.06		0.691	0.703		0.456	pCi/g	12/03/20 13:12	12/24/20 07:52	1

Client Sample ID: HPPG-SFU-TU107A-006

Lab Sample ID: 160-40595-8

Date Collected: 11/24/20 13:20

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.343		0.235	0.237		0.101	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Actinium-227	0.0902	U	0.306	0.306		0.356	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Bismuth-212	0.484	U	1.27	1.27		1.01	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Bismuth-214	0.265		0.116	0.119		0.0581	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Cesium-137	-0.0576	U	0.0980	0.0981	0.0700	0.0770	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Lead-210	0.598	U	1.65	1.66		1.06	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Lead-212	0.385		0.0939	0.102		0.0486	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Lead-214	0.310		0.121	0.125		0.0599	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Potassium-40	8.16		1.42	1.64		0.263	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Protactinium-231	0.000	U	1.00	1.00		2.27	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Protactinium-234	0.0897	U	0.275	0.275		0.223	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Radium-226	0.265		0.116	0.119	0.200	0.0581	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Radium-228	0.343		0.235	0.237		0.101	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Thallium-208	0.170		0.0481	0.0512		0.00793	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Thorium 228	0.385		0.0939	0.102		0.0486	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Thorium-232	0.343		0.235	0.237		0.101	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Thorium-234	1.05		0.668	0.678		0.390	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Uranium-235	0.127	U	0.253	0.253		0.416	pCi/g	12/03/20 13:12	12/24/20 08:25	1
Uranium-238	1.05		0.668	0.678		0.390	pCi/g	12/03/20 13:12	12/24/20 08:25	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-007

Lab Sample ID: 160-40595-9

Date Collected: 11/24/20 13:32

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.389		0.102	0.110		0.0372	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Actinium-227	0.0112	U	0.451	0.451		0.268	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Bismuth-212	0.296	U	0.539	0.540		0.417	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Bismuth-214	0.304		0.0820	0.0879		0.0322	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Cesium-137	0.00998	U	0.0506	0.0506	0.0700	0.0273	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Lead-210	0.439	U	1.10	1.10		0.882	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Lead-212	0.320		0.0627	0.0752		0.0261	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Lead-214	0.296		0.0898	0.0950		0.0422	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Potassium-40	7.17		1.05	1.28		0.235	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Protactinium-231	0.650	U	2.04	2.04		1.66	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Protactinium-234	0.0914	U	0.157	0.157		0.161	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Radium-226	0.304		0.0820	0.0879	0.200	0.0322	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Radium-228	0.389		0.102	0.110		0.0372	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Thallium-208	0.0883		0.0633	0.0639		0.0267	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Thorium 228	0.320		0.0627	0.0752		0.0261	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Thorium-232	0.389		0.102	0.110		0.0372	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Thorium-234	0.0978	U	0.445	0.445		0.658	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Uranium-235	-0.0529	U	0.396	0.396		0.325	pCi/g	12/03/20 13:12	12/24/20 08:24	1
Uranium-238	0.0978	U	0.445	0.445		0.658	pCi/g	12/03/20 13:12	12/24/20 08:24	1

Client Sample ID: HPPG-SFU-TU107A-008

Lab Sample ID: 160-40595-10

Date Collected: 11/24/20 13:24

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.290		0.102	0.106		0.0610	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Actinium-227	0.122	U	0.392	0.392		0.228	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Bismuth-212	0.218	U	0.414	0.414		0.317	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Bismuth-214	0.348		0.0833	0.0908		0.0300	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Cesium-137	-0.0319	U	0.0505	0.0506	0.0700	0.0393	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Lead-210	0.279	U	0.945	0.946		0.764	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Lead-212	0.266		0.0589	0.0682		0.0287	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Lead-214	0.371		0.0926	0.100		0.0390	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Potassium-40	7.70		1.10	1.35		0.192	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Protactinium-231	-0.0000001	U	1.80	1.80		1.49	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Protactinium-234	-0.0407	U	0.114	0.114		0.184	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Radium-226	0.348		0.0833	0.0908	0.200	0.0300	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Radium-228	0.290		0.102	0.106		0.0610	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Thallium-208	0.119		0.0389	0.0408		0.0109	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Thorium 228	0.266		0.0589	0.0682		0.0287	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Thorium-232	0.290		0.102	0.106		0.0610	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Thorium-234	0.296	U	0.629	0.630		0.720	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Uranium-235	-0.0736	U	0.199	0.199		0.160	pCi/g	12/03/20 13:12	12/24/20 08:26	1
Uranium-238	0.296	U	0.629	0.630		0.720	pCi/g	12/03/20 13:12	12/24/20 08:26	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-009

Lab Sample ID: 160-40595-11

Date Collected: 11/24/20 13:26

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.233		0.240	0.241		0.131	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Actinium-227	-0.344	U	0.737	0.738		0.443	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Bismuth-212	-0.507	U	0.724	0.726		0.825	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Bismuth-214	0.387		0.147	0.152		0.0755	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Cesium-137	0.00263	U	0.0580	0.0580	0.0700	0.0471	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Lead-210	1.00		1.17	1.17		0.729	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Lead-212	0.291		0.0882	0.0959		0.0453	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Lead-214	0.325		0.108	0.113		0.0702	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Potassium-40	4.94		1.86	1.92		0.755	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Protactinium-231	-0.506	U	2.45	2.45		2.00	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Protactinium-234	0.0452	U	0.0999	0.100		0.172	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Radium-226	0.387		0.147	0.152	0.200	0.0755	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Radium-228	0.233		0.240	0.241		0.131	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Thallium-208	0.117		0.0810	0.0819		0.0388	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Thorium 228	0.291		0.0882	0.0959		0.0453	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Thorium-232	0.233		0.240	0.241		0.131	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Thorium-234	-0.424	U	0.561	0.563		0.749	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Uranium-235	-0.0109	U	0.301	0.301		0.261	pCi/g	12/03/20 13:12	12/24/20 08:28	1
Uranium-238	-0.424	U	0.561	0.563		0.749	pCi/g	12/03/20 13:12	12/24/20 08:28	1

Client Sample ID: HPPG-SFU-TU107A-010

Lab Sample ID: 160-40595-12

Date Collected: 11/24/20 13:28

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.173	U	0.296	0.297		0.178	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Actinium-227	0.104	U	0.363	0.363		0.415	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Bismuth-212	0.315	U	1.11	1.11		0.894	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Bismuth-214	0.0352	U	0.0427	0.0429		0.211	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Cesium-137	0.00411	U	0.0500	0.0500	0.0700	0.0407	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Lead-210	2.02		1.46	1.49		0.942	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Lead-212	0.377		0.105	0.114		0.0612	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Lead-214	0.346		0.117	0.123		0.0550	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Potassium-40	8.37		1.47	1.75		0.315	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Protactinium-231	0.403	U	1.58	1.58		2.48	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Protactinium-234	-0.0483	U	0.146	0.146		0.333	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Radium-226	0.0352	U	0.0427	0.0429	0.200	0.211	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Radium-228	0.173	U	0.296	0.297		0.178	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Thallium-208	0.0808		0.0867	0.0872		0.0406	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Thorium 228	0.377		0.105	0.114		0.0612	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Thorium-232	0.173	U	0.296	0.297		0.178	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Thorium-234	0.670		0.536	0.542		0.452	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Uranium-235	-0.161	U	0.312	0.312		0.631	pCi/g	12/03/20 13:12	12/24/20 08:27	1
Uranium-238	0.670		0.536	0.542		0.452	pCi/g	12/03/20 13:12	12/24/20 08:27	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-011

Lab Sample ID: 160-40595-13

Date Collected: 11/24/20 13:32

Matrix: Solid

Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	0.0769	U	0.132	0.132	0.331	0.102	pCi/g	12/09/20 18:42	12/18/20 20:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	99.3		40 - 110					12/09/20 18:42	12/18/20 20:08	1
Y Carrier	97.6		40 - 110					12/09/20 18:42	12/18/20 20:08	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.374		0.0603	0.0680	0.250	0.0169	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.316		0.0663	0.0714	0.250	0.0284	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.391		0.0573	0.0660	0.250	0.0118	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	91.6		30 - 110					12/15/20 14:37	12/30/20 10:45	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.620		0.185	0.195		0.0321	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Actinium-227	-0.266	U	0.692	0.693		0.420	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Bismuth-212	-0.0300	U	0.742	0.742		0.608	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Bismuth-214	0.532		0.152	0.161		0.0640	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Cesium-137	0.0193	U	0.0396	0.0396	0.0700	0.0295	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Lead-210	-0.949	U	1.93	1.93		1.62	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Lead-212	0.473		0.106	0.117		0.0565	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Lead-214	0.534		0.133	0.144		0.0507	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Potassium-40	11.9		1.60	2.00		0.124	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Protactinium-231	-0.635	U	3.08	3.08		2.52	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Protactinium-234	0.0973	U	0.295	0.295		0.240	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Radium-226	0.532		0.152	0.161	0.200	0.0640	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Radium-228	0.620		0.185	0.195		0.0321	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Thallium-208	0.178		0.0595	0.0622		0.0195	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Thorium 228	0.473		0.106	0.117		0.0565	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Thorium-232	0.620		0.185	0.195		0.0321	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Thorium-234	-0.641	U	0.745	0.749		0.959	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Uranium-235	0.000	U	0.227	0.227		0.432	pCi/g	12/03/20 13:12	12/24/20 09:31	1
Uranium-238	-0.641	U	0.745	0.749		0.959	pCi/g	12/03/20 13:12	12/24/20 09:31	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-012

Lab Sample ID: 160-40595-14

Date Collected: 11/24/20 13:35

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.358		0.109	0.115		0.0367	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Actinium-227	-0.222	U	0.284	0.285		0.246	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Bismuth-212	0.123	U	0.296	0.296		0.224	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Bismuth-214	0.290		0.0891	0.0940		0.0390	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Cesium-137	-0.0200	U	0.0519	0.0520	0.0700	0.0414	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Lead-210	0.415	U	0.777	0.779		0.613	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Lead-212	0.323		0.0621	0.0748		0.0278	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Lead-214	0.305		0.0740	0.0805		0.0353	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Potassium-40	5.88		0.914	1.09		0.215	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Protactinium-231	0.000	U	0.234	0.234		1.42	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Protactinium-234	0.0589	U	0.169	0.169		0.144	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Radium-226	0.290		0.0891	0.0940	0.200	0.0390	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Radium-228	0.358		0.109	0.115		0.0367	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Thallium-208	0.124		0.0453	0.0470		0.0172	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Thorium 228	0.323		0.0621	0.0748		0.0278	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Thorium-232	0.358		0.109	0.115		0.0367	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Thorium-234	0.0110	U	0.0193	0.0194		0.535	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Uranium-235	0.0504	U	0.149	0.149		0.252	pCi/g	12/03/20 13:12	12/24/20 08:56	1
Uranium-238	0.0110	U	0.0193	0.0194		0.535	pCi/g	12/03/20 13:12	12/24/20 08:56	1

Client Sample ID: HPPG-SFU-TU107A-013

Lab Sample ID: 160-40595-15

Date Collected: 11/24/20 13:34

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.245		0.149	0.151		0.0622	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Actinium-227	0.0969	U	0.296	0.296		0.171	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Bismuth-212	0.154	U	0.463	0.463		0.366	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Bismuth-214	0.103	U	0.132	0.133		0.120	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Cesium-137	-0.0325	U	0.0487	0.0488	0.0700	0.0376	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Lead-210	0.195	U	0.954	0.954		0.775	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Lead-212	0.0268	U	0.0915	0.0916		0.0742	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Lead-214	0.110		0.0375	0.0391		0.0677	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Potassium-40	5.63		0.867	1.04		0.0777	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Protactinium-231	0.233	U	0.936	0.936		1.48	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Protactinium-234	0.0969	U	0.163	0.164		0.148	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Radium-226	0.103	U	0.132	0.133	0.200	0.120	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Radium-228	0.245		0.149	0.151		0.0622	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Thallium-208	0.124		0.0432	0.0451		0.0144	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Thorium 228	0.0268	U	0.0915	0.0916		0.0742	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Thorium-232	0.245		0.149	0.151		0.0622	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Thorium-234	0.137	U	0.323	0.323		0.647	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Uranium-235	0.0611	U	0.137	0.137		0.269	pCi/g	12/03/20 13:12	12/24/20 09:00	1
Uranium-238	0.137	U	0.323	0.323		0.647	pCi/g	12/03/20 13:12	12/24/20 09:00	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-014

Lab Sample ID: 160-40595-16

Date Collected: 11/24/20 13:37

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.127	U	0.229	0.229		0.138	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Actinium-227	0.159	U	0.416	0.417		0.248	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Bismuth-212	0.347	U	0.732	0.733		0.562	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Bismuth-214	0.266		0.123	0.126		0.0646	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Cesium-137	0.0103	U	0.0593	0.0593	0.0700	0.0475	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Lead-210	1.16		1.13	1.14		0.689	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Lead-212	0.312		0.0774	0.0873		0.0332	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Lead-214	0.326		0.115	0.120		0.0584	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Potassium-40	6.65		1.34	1.50		0.251	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Protactinium-231	0.000	U	0.735	0.735		2.38	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Protactinium-234	0.0577	U	0.150	0.150		0.120	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Radium-226	0.266		0.123	0.126	0.200	0.0646	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Radium-228	0.127	U	0.229	0.229		0.138	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Thallium-208	0.0679		0.0590	0.0594		0.0413	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Thorium 228	0.312		0.0774	0.0873		0.0332	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Thorium-232	0.127	U	0.229	0.229		0.138	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Thorium-234	0.516		0.448	0.451		0.296	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Uranium-235	0.0808	U	0.235	0.235		0.180	pCi/g	12/03/20 13:12	12/24/20 09:02	1
Uranium-238	0.516		0.448	0.451		0.296	pCi/g	12/03/20 13:12	12/24/20 09:02	1

Client Sample ID: HPPG-SFU-TU107A-015

Lab Sample ID: 160-40595-17

Date Collected: 11/24/20 13:40

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.166		0.209	0.210		0.129	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Actinium-227	0.0788	U	0.629	0.629		0.389	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Bismuth-212	0.154	U	1.02	1.02		0.829	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Bismuth-214	0.245		0.160	0.162		0.137	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Cesium-137	-0.0195	U	0.0677	0.0677	0.0700	0.0539	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Lead-210	-0.886	U	1.69	1.69		1.43	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Lead-212	0.317		0.0876	0.0952		0.0471	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Lead-214	0.318		0.111	0.117		0.0537	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Potassium-40	8.00		1.39	1.66		0.295	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Protactinium-231	0.733	U	1.91	1.91		2.14	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Protactinium-234	-0.0298	U	0.325	0.325		0.266	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Radium-226	0.245		0.160	0.162	0.200	0.137	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Radium-228	0.166		0.209	0.210		0.129	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Thallium-208	0.135		0.0613	0.0633		0.0245	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Thorium 228	0.317		0.0876	0.0952		0.0471	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Thorium-232	0.166		0.209	0.210		0.129	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Thorium-234	-0.963	U	0.838	0.846		1.34	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Uranium-235	0.191	U	0.199	0.201		0.455	pCi/g	12/03/20 13:12	12/24/20 09:04	1
Uranium-238	-0.963	U	0.838	0.846		1.34	pCi/g	12/03/20 13:12	12/24/20 09:04	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-016

Lab Sample ID: 160-40595-18

Date Collected: 11/24/20 13:43

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.343		0.195	0.198		0.137	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Actinium-227	0.0474	U	0.119	0.120		0.353	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Bismuth-212	0.000	U	0.364	0.364		0.231	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Bismuth-214	0.176		0.111	0.112		0.166	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Cesium-137	-0.0118	U	0.0750	0.0750	0.0700	0.0609	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Lead-210	1.29		1.65	1.65		1.01	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Lead-212	0.365		0.0995	0.107		0.0585	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Lead-214	0.356		0.121	0.126		0.0557	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Potassium-40	8.55		1.32	1.58		0.119	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Protactinium-231	-0.527	U	2.73	2.73		2.23	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Protactinium-234	-0.103	U	0.313	0.313		0.254	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Radium-226	0.176		0.111	0.112	0.200	0.166	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Radium-228	0.343		0.195	0.198		0.137	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Thallium-208	0.138		0.0767	0.0780		0.0316	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Thorium 228	0.365		0.0995	0.107		0.0585	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Thorium-232	0.343		0.195	0.198		0.137	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Thorium-234	0.747		0.603	0.609		0.388	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Uranium-235	0.0931	U	0.221	0.221		0.456	pCi/g	12/03/20 13:12	12/24/20 10:03	1
Uranium-238	0.747		0.603	0.609		0.388	pCi/g	12/03/20 13:12	12/24/20 10:03	1

Client Sample ID: HPPG-SFU-TU107A-017

Lab Sample ID: 160-40595-19

Date Collected: 11/24/20 13:44

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.194		0.138	0.139		0.0652	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Actinium-227	0.0525	U	0.100	0.100		0.305	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Bismuth-212	-0.0171	U	0.507	0.507		0.419	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Bismuth-214	0.276		0.0969	0.101		0.0458	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Cesium-137	0.0149	U	0.0471	0.0471	0.0700	0.0375	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Lead-210	0.133	U	1.00	1.00		0.819	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Lead-212	0.317		0.0620	0.0743		0.0258	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Lead-214	0.335		0.0819	0.0890		0.0408	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Potassium-40	6.96		1.03	1.25		0.231	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Protactinium-231	-0.726	U	2.26	2.27		1.84	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Protactinium-234	0.0927	U	0.153	0.154		0.162	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Radium-226	0.276		0.0969	0.101	0.200	0.0458	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Radium-228	0.194		0.138	0.139		0.0652	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Thallium-208	0.0986		0.0361	0.0375		0.0146	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Thorium 228	0.317		0.0620	0.0743		0.0258	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Thorium-232	0.194		0.138	0.139		0.0652	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Thorium-234	0.492		0.346	0.350		0.254	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Uranium-235	0.0771	U	0.148	0.148		0.286	pCi/g	12/03/20 13:12	12/24/20 09:29	1
Uranium-238	0.492		0.346	0.350		0.254	pCi/g	12/03/20 13:12	12/24/20 09:29	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-018

Lab Sample ID: 160-40595-20

Date Collected: 11/24/20 13:46

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.176		0.108	0.110		0.0416	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Actinium-227	0.0185	U	0.123	0.123		0.228	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Bismuth-212	0.000	U	0.309	0.309		0.355	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Bismuth-214	0.184		0.0747	0.0771		0.0368	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Cesium-137	0.0124	U	0.0401	0.0401	0.0700	0.0319	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Lead-210	-0.539	U	1.17	1.17		0.938	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Lead-212	0.194		0.0533	0.0590		0.0291	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Lead-214	0.178		0.0651	0.0677		0.0428	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Potassium-40	6.33		0.893	1.10		0.0734	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Protactinium-231	0.418	U	1.58	1.58		1.29	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Protactinium-234	-0.0159	U	0.0437	0.0437		0.149	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Radium-226	0.184		0.0747	0.0771	0.200	0.0368	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Radium-228	0.176		0.108	0.110		0.0416	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Thallium-208	0.0722		0.0408	0.0415		0.0170	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Thorium 228	0.194		0.0533	0.0590		0.0291	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Thorium-232	0.176		0.108	0.110		0.0416	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Thorium-234	0.247	U	0.421	0.422		0.382	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Uranium-235	-0.00662	U	0.0189	0.0189		0.256	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Uranium-238	0.247	U	0.421	0.422		0.382	pCi/g	12/03/20 13:12	12/24/20 09:37	1

Client Sample ID: HPPG-SFU-TU107A-019

Lab Sample ID: 160-40595-21

Date Collected: 11/24/20 13:42

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.116		0.212	0.213		0.114	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Actinium-227	0.0998	U	0.447	0.447		0.272	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Bismuth-212	-0.00398	U	0.709	0.709		0.334	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Bismuth-214	0.0432	U	0.0493	0.0495		0.122	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Cesium-137	0.00681	U	0.0570	0.0570	0.0700	0.0459	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Lead-210	-0.187	U	1.12	1.12		0.810	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Lead-212	0.265		0.0766	0.0839		0.0378	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Lead-214	0.205		0.103	0.106		0.0623	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Potassium-40	5.21		1.54	1.63		0.554	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Protactinium-231	0.000	U	0.257	0.257		1.77	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Protactinium-234	0.0196	U	0.0357	0.0358		0.172	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Radium-226	0.0432	U	0.0493	0.0495	0.200	0.122	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Radium-228	0.116		0.212	0.213		0.114	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Thallium-208	0.0810		0.0575	0.0581		0.0286	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Thorium 228	0.265		0.0766	0.0839		0.0378	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Thorium-232	0.116		0.212	0.213		0.114	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Thorium-234	-0.120	U	0.734	0.734		0.608	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Uranium-235	0.00405	U	0.0607	0.0607		0.241	pCi/g	12/03/20 13:12	12/24/20 09:35	1
Uranium-238	-0.120	U	0.734	0.734		0.608	pCi/g	12/03/20 13:12	12/24/20 09:35	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-020

Lab Sample ID: 160-40595-22

Date Collected: 11/24/20 13:47

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.498		0.162	0.171		0.0339	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Actinium-227	0.148	U	0.300	0.301		0.307	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Bismuth-212	-0.606	U	0.997	1.00		0.772	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Bismuth-214	0.0721	U	0.186	0.186		0.171	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Cesium-137	-0.00261	U	0.0553	0.0553	0.0700	0.0453	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Lead-210	1.45		1.84	1.85		1.45	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Lead-212	0.248		0.0795	0.0847		0.0436	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Lead-214	0.351		0.114	0.121		0.0675	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Potassium-40	8.01		1.40	1.68		0.300	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Protactinium-231	0.000	U	0.308	0.308		1.72	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Protactinium-234	0.0222	U	0.0420	0.0420		0.317	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Radium-226	0.0721	U	0.186	0.186	0.200	0.171	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Radium-228	0.498		0.162	0.171		0.0339	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Thallium-208	0.165		0.0810	0.0832		0.0324	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Thorium 228	0.248		0.0795	0.0847		0.0436	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Thorium-232	0.498		0.162	0.171		0.0339	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Thorium-234	0.406		0.507	0.509		0.385	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Uranium-235	-0.0898	U	0.199	0.199		0.600	pCi/g	12/03/20 13:12	12/24/20 09:37	1
Uranium-238	0.406		0.507	0.509		0.385	pCi/g	12/03/20 13:12	12/24/20 09:37	1

Client Sample ID: HPPG-SFU-TU107A-021

Lab Sample ID: 160-40595-23

Date Collected: 11/24/20 13:46

Matrix: Solid

Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Strontium-90	0.0334	U	0.127	0.127	0.331	0.101	pCi/g	12/09/20 18:42	12/18/20 20:08	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	98.5		40 - 110					12/09/20 18:42	12/18/20 20:08	1
Y Carrier	96.1		40 - 110					12/09/20 18:42	12/18/20 20:08	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Thorium-228	0.467		0.0703	0.0805	0.250	0.0219	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.273		0.0631	0.0671	0.250	0.0247	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.440		0.0618	0.0720	0.250	0.00796	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	80.2		30 - 110					12/15/20 14:37	12/30/20 10:45	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-021

Lab Sample ID: 160-40595-23

Date Collected: 11/24/20 13:46

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.411		0.277	0.281		0.124	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Actinium-227	0.297		0.464	0.465		0.279	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Bismuth-212	0.416	U	0.876	0.877		0.686	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Bismuth-214	0.198		0.0991	0.101		0.144	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Cesium-137	-0.0284	U	0.0674	0.0675	0.0700	0.0529	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Lead-210	0.378	U	1.53	1.53		1.06	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Lead-212	0.472		0.101	0.112		0.0501	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Lead-214	0.480		0.122	0.131		0.0649	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Potassium-40	9.72		1.69	1.95		0.429	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Protactinium-231	0.000	U	0.297	0.297		2.41	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Protactinium-234	-0.116	U	0.351	0.351		0.286	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Radium-226	0.198		0.0991	0.101	0.200	0.144	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Radium-228	0.411		0.277	0.281		0.124	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Thallium-208	0.194		0.0513	0.0550		0.00792	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Thorium 228	0.472		0.101	0.112		0.0501	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Thorium-232	0.411		0.277	0.281		0.124	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Thorium-234	0.726		0.622	0.628		0.396	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Uranium-235	0.153	U	0.496	0.496		0.404	pCi/g	12/03/20 13:12	12/24/20 10:36	1
Uranium-238	0.726		0.622	0.628		0.396	pCi/g	12/03/20 13:12	12/24/20 10:36	1

Client Sample ID: HPPG-SFU-TU107A-022

Lab Sample ID: 160-40595-24

Date Collected: 11/24/20 13:50

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.385		0.141	0.146		0.0644	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Actinium-227	0.0241	U	0.0998	0.0999		0.269	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Bismuth-212	0.288	U	0.563	0.564		0.439	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Bismuth-214	0.284		0.0785	0.0838		0.0313	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Cesium-137	-0.0151	U	0.0501	0.0501	0.0700	0.0401	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Lead-210	0.441	U	0.826	0.828		0.651	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Lead-212	0.327		0.0618	0.0749		0.0249	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Lead-214	0.208		0.0725	0.0756		0.0346	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Potassium-40	7.32		1.05	1.29		0.228	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Protactinium-231	-0.503	U	1.75	1.75		1.42	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Protactinium-234	0.0964	U	0.167	0.167		0.156	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Radium-226	0.284		0.0785	0.0838	0.200	0.0313	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Radium-228	0.385		0.141	0.146		0.0644	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Thallium-208	0.119		0.0387	0.0406		0.0137	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Thorium 228	0.327		0.0618	0.0749		0.0249	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Thorium-232	0.385		0.141	0.146		0.0644	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Thorium-234	0.248	U	0.729	0.730		0.594	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Uranium-235	-0.0369	U	0.0731	0.0732		0.301	pCi/g	12/03/20 13:12	12/24/20 10:01	1
Uranium-238	0.248	U	0.729	0.730		0.594	pCi/g	12/03/20 13:12	12/24/20 10:01	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-023

Lab Sample ID: 160-40595-25

Date Collected: 11/24/20 13:52

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.116	U	0.157	0.158		0.138	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Actinium-227	-0.117	U	0.416	0.416		0.243	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Bismuth-212	-0.377	U	0.634	0.635		0.497	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Bismuth-214	0.270		0.0895	0.0938		0.0414	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Cesium-137	0.0134	U	0.0447	0.0447	0.0700	0.0358	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Lead-210	-0.213	U	0.902	0.903		0.731	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Lead-212	0.327		0.0621	0.0752		0.0286	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Lead-214	0.333		0.0708	0.0788		0.0390	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Potassium-40	7.92		0.998	1.29		0.0732	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Protactinium-231	0.000	U	0.201	0.201		1.60	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Protactinium-234	0.0983	U	0.179	0.179		0.142	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Radium-226	0.270		0.0895	0.0938	0.200	0.0414	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Radium-228	0.116	U	0.157	0.158		0.138	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Thallium-208	0.140		0.0376	0.0403		0.00926	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Thorium 228	0.327		0.0621	0.0752		0.0286	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Thorium-232	0.116	U	0.157	0.158		0.138	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Thorium-234	0.697		0.388	0.396		0.210	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Uranium-235	0.147	U	0.247	0.247		0.277	pCi/g	12/03/20 13:12	12/24/20 10:44	1
Uranium-238	0.697		0.388	0.396		0.210	pCi/g	12/03/20 13:12	12/24/20 10:44	1

Client Sample ID: HPPG-SFU-TU107A-024

Lab Sample ID: 160-40595-26

Date Collected: 11/24/20 13:54

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.631		0.146	0.159		0.0288	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Actinium-227	0.147	U	0.377	0.377		0.315	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Bismuth-212	0.350	U	0.587	0.588		0.442	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Bismuth-214	0.445		0.143	0.150		0.0598	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Cesium-137	0.0228	U	0.0405	0.0406	0.0700	0.0302	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Lead-210	1.18		1.49	1.50		0.949	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Lead-212	0.360		0.0864	0.0981		0.0440	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Lead-214	0.464		0.112	0.122		0.0471	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Potassium-40	7.79		1.27	1.50		0.267	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Protactinium-231	0.000	U	0.610	0.610		2.17	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Protactinium-234	0.0856	U	0.275	0.275		0.209	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Radium-226	0.445		0.143	0.150	0.200	0.0598	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Radium-228	0.631		0.146	0.159		0.0288	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Thallium-208	0.159		0.0556	0.0580		0.0209	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Thorium 228	0.360		0.0864	0.0981		0.0440	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Thorium-232	0.631		0.146	0.159		0.0288	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Thorium-234	0.646		0.629	0.633		0.440	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Uranium-235	-0.169	U	0.534	0.534		0.435	pCi/g	12/03/20 14:31	12/30/20 06:36	1
Uranium-238	0.646		0.629	0.633		0.440	pCi/g	12/03/20 14:31	12/30/20 06:36	1

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Client Sample ID: HPPG-SFU-TU107A-025

Lab Sample ID: 160-40595-27

Date Collected: 11/24/20 13:55

Matrix: Solid

Date Received: 11/27/20 09:12

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
			Uncert.	Uncert.						
			(2σ+/-)	(2σ+/-)						
Actinium 228	0.544		0.103	0.117		0.0209	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Actinium-227	0.138	U	0.292	0.292		0.265	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Bismuth-212	-0.0145	U	0.476	0.476		0.391	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Bismuth-214	0.290		0.0805	0.0860		0.0325	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Cesium-137	0.0280	U	0.0514	0.0515	0.0700	0.0402	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Lead-210	-0.369	U	1.25	1.25		1.01	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Lead-212	0.377		0.0722	0.0871		0.0346	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Lead-214	0.332		0.0749	0.0824		0.0394	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Potassium-40	7.64		1.04	1.30		0.0824	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Protactinium-231	0.000	U	0.196	0.196		1.60	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Protactinium-234	0.0477	U	0.0344	0.0348		0.193	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Radium-226	0.290		0.0805	0.0860	0.200	0.0325	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Radium-228	0.544		0.103	0.117		0.0209	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Thallium-208	0.106		0.0549	0.0560		0.0292	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Thorium 228	0.377		0.0722	0.0871		0.0346	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Thorium-232	0.544		0.103	0.117		0.0209	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Thorium-234	-0.0678	U	0.166	0.167		0.863	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Uranium-235	0.0911	U	0.334	0.334		0.325	pCi/g	12/03/20 14:31	12/30/20 06:28	1
Uranium-238	-0.0678	U	0.166	0.167		0.863	pCi/g	12/03/20 14:31	12/30/20 06:28	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Method: 905 - Strontium-90 (GFPC)

Lab Sample ID: MB 160-491323/23-A
Matrix: Solid
Analysis Batch: 492430

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491323

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	0.07392	U	0.140	0.140	0.331	0.108	pCi/g	12/09/20 18:42	12/18/20 20:20	1
Carrier	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Sr Carrier	100		40 - 110		12/09/20 18:42	12/18/20 20:20	1			
Y Carrier	92.7		40 - 110		12/09/20 18:42	12/18/20 20:20	1			

Lab Sample ID: LCS 160-491323/1-A
Matrix: Solid
Analysis Batch: 492430

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491323

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Strontium-90	7.76	5.897		0.638	0.331	0.109	pCi/g	76	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Sr Carrier	100		40 - 110						
Y Carrier	99.8		40 - 110						

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-491944/1-A
Matrix: Solid
Analysis Batch: 493574

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491944

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	-0.03528	U	0.0205	0.0207	0.250	0.0163	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	-0.06446	U	0.0317	0.0321	0.250	0.0228	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	-0.003259	U	0.00917	0.00917	0.250	0.00754	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Thorium-229	93.0		30 - 110		12/15/20 14:37	12/30/20 10:45	1			

Lab Sample ID: LCS 160-491944/2-A
Matrix: Solid
Analysis Batch: 493575

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491944

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Thorium-230	2.01	1.989		0.213	0.250	0.0233	pCi/g	99	81 - 118
Tracer	LCS %Yield	LCS Qualifier	Limits						
Thorium-229	89.9		30 - 110						

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry) (Continued)

Lab Sample ID: 160-40595-1 DU
Matrix: Solid
Analysis Batch: 493577

Client Sample ID: HPPG-F-047
Prep Type: Total/NA
Prep Batch: 491944

Analyte	Sample	Sample	DU		Total	LOQ	DLC	Unit	RER	Limit
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					
Thorium-228	0.426		0.3974		0.0724	0.250	0.0166	pCi/g	0.19	1
Thorium-230	0.321		0.2904		0.0688	0.250	0.0240	pCi/g	0.22	1
Thorium-232	0.403		0.4021		0.0684	0.250	0.00807	pCi/g	0.01	1

Tracer	DU %Yield	DU Qualifier	Limits
Thorium-229	86.1		30 - 110

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-490802/1-A
Matrix: Solid
Analysis Batch: 492976

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490802

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	-0.03762	U	0.218	0.218		0.113	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Actinium-227	-0.3031	U	0.525	0.526		0.335	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Bismuth-212	-0.3011	U	0.398	0.399		0.562	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Bismuth-214	-0.06394	U	0.114	0.114		0.134	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Cesium-137	0.0000	U	0.00946	0.00946	0.0700	0.0181	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Lead-210	0.2354	U	0.771	0.771		0.611	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Lead-212	-0.004504	U	0.0798	0.0798		0.0671	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Lead-214	-0.04921	U	0.0735	0.0737		0.0644	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Potassium-40	0.09750	U	0.430	0.430		0.327	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Protactinium-231	0.2248	U	0.795	0.795		1.45	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Protactinium-234	0.01682	U	0.0825	0.0825		0.0661	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Radium-226	-0.06394	U	0.114	0.114	0.200	0.134	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Radium-228	-0.03762	U	0.218	0.218		0.113	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Thallium-208	0.007245	U	0.0113	0.0113		0.0301	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Thorium 228	-0.004504	U	0.0798	0.0798		0.0671	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Thorium-232	-0.03762	U	0.218	0.218		0.113	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Thorium-234	0.0000	U	0.143	0.143		0.539	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Uranium-235	0.05006	U	0.229	0.229		0.185	pCi/g	12/03/20 11:24	12/24/20 10:35	1
Uranium-238	0.0000	U	0.143	0.143		0.539	pCi/g	12/03/20 11:24	12/24/20 10:35	1

Lab Sample ID: LCS 160-490802/2-A
Matrix: Solid
Analysis Batch: 492974

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490802

Analyte	Spike Added	LCS	LCS	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
		Result	Qual	Uncert. (2σ+/-)					
Americium-241	96.4	91.19		9.58		0.524	pCi/g	95	87 - 116
Cesium-137	26.7	25.30		2.69	0.0700	0.0802	pCi/g	95	87 - 120
Cobalt-60	9.43	8.864		0.930		0.0237	pCi/g	94	87 - 115

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: 160-40595-4 DU
Matrix: Solid
Analysis Batch: 492977

Client Sample ID: HPPG-SFU-TU107A-002
Prep Type: Total/NA
Prep Batch: 490802

Analyte	Sample	Sample	DU	DU	Total	LOQ	DLC	Unit	RER	RER	Limit
	Result	Qual	Result	Qual	Uncert. (2σ+/-)						
Actinium 228	0.452		0.4721		0.121		0.0607	pCi/g	0.08		1
Actinium-227	0.140	U	0.3806		0.357		0.196	pCi/g	0.33		1
Bismuth-212	0.220	U	0.3069	U	0.646		0.503	pCi/g	0.08		1
Bismuth-214	0.338		0.2963		0.106		0.0385	pCi/g	0.20		1
Cesium-137	0.0146	U	-0.04725	U	0.0750	0.0700	0.0586	pCi/g	0.49		1
Lead-210	0.518	U	1.105		1.26		0.801	pCi/g	0.26		1
Lead-212	0.372		0.4171		0.0985		0.0385	pCi/g	0.25		1
Lead-214	0.375		0.3183		0.108		0.0446	pCi/g	0.27		1
Potassium-40	8.79		8.389		1.50		0.270	pCi/g	0.14		1
Protactinium-231	0.527	U	0.3145	U	1.20		1.86	pCi/g	0.07		1
Protactinium-234	0.105	U	-0.08394	U	0.206		0.166	pCi/g	0.49		1
Radium-226	0.338		0.2963		0.106	0.200	0.0385	pCi/g	0.20		1
Radium-228	0.452		0.4721		0.121		0.0607	pCi/g	0.08		1
Thallium-208	0.133		0.1359		0.0487		0.0194	pCi/g	0.03		1
Thorium 228	0.372		0.4171		0.0985		0.0385	pCi/g	0.25		1
Thorium-232	0.452		0.4721		0.121		0.0607	pCi/g	0.08		1
Thorium-234	0.257	U	0.3840		0.470		0.363	pCi/g	0.1		1
Uranium-235	-0.162	U	0.07607	U	0.187		0.246	pCi/g	0.38		1
Uranium-238	0.257	U	0.3840		0.470		0.363	pCi/g	0.1		1

Lab Sample ID: MB 160-490806/1-A
Matrix: Solid
Analysis Batch: 492974

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490806

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.05721	U	0.116	0.116		0.0625	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Actinium-227	0.04285	U	0.0714	0.0716		0.259	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Bismuth-212	-0.006457	U	0.333	0.333		0.273	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Bismuth-214	0.001033	U	0.000924	0.000930		0.141	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Cesium-137	0.01744	U	0.0296	0.0297	0.0700	0.0211	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Lead-210	0.4198	U	0.929	0.931		0.732	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Lead-212	0.0009085	U	0.0512	0.0512		0.0416	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Lead-214	-0.02615	U	0.0747	0.0747		0.0630	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Potassium-40	0.3313		0.250	0.253		0.110	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Protactinium-231	0.0000	U	0.460	0.460		1.72	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Protactinium-234	0.03941	U	0.0812	0.0813		0.148	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Radium-226	0.001033	U	0.000924	0.000930	0.200	0.141	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Radium-228	0.05721	U	0.116	0.116		0.0625	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Thallium-208	-0.03518	U	0.0689	0.0690		0.0361	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Thorium 228	0.0009085	U	0.0512	0.0512		0.0416	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Thorium-232	0.05721	U	0.116	0.116		0.0625	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Thorium-234	0.0000	U	0.109	0.109		0.573	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Uranium-235	0.0000	U	0.112	0.112		0.240	pCi/g	12/03/20 12:24	12/24/20 05:52	1
Uranium-238	0.0000	U	0.109	0.109		0.573	pCi/g	12/03/20 12:24	12/24/20 05:52	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: LCS 160-490806/2-A
Matrix: Solid
Analysis Batch: 492975

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490806

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	%Rec	%Rec. Limits	
Americium-241	96.4	102.3		10.7		0.361	pCi/g	106	87 - 116	
Cesium-137	26.7	26.88		2.90	0.0700	0.0857	pCi/g	101	87 - 120	
Cobalt-60	9.43	9.636		1.04		0.0186	pCi/g	102	87 - 115	

Lab Sample ID: 160-40595-5 DU
Matrix: Solid
Analysis Batch: 492973

Client Sample ID: HPPG-SFU-TU107A-003
Prep Type: Total/NA
Prep Batch: 490806

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	RER	RER
										Limit
Actinium 228	0.216		0.3984		0.166		0.138	pCi/g	0.40	1
Actinium-227	0.0423	U	-0.3803	U	0.723		0.436	pCi/g	0.53	1
Bismuth-212	0.362	U	-0.01438	U	0.795		0.654	pCi/g	0.23	1
Bismuth-214	0.272		0.4264		0.132		0.0567	pCi/g	0.54	1
Cesium-137	-0.0299	U	-0.02260	U	0.0585	0.0700	0.0458	pCi/g	0.06	1
Lead-210	1.34		0.9226	U	1.42		0.929	pCi/g	0.14	1
Lead-212	0.387		0.4262		0.103		0.0450	pCi/g	0.19	1
Lead-214	0.387		0.4767		0.139		0.0565	pCi/g	0.32	1
Potassium-40	8.86		8.865		1.62		0.119	pCi/g	0	1
Protactinium-231	0.000	U	-0.4452	U	2.74		2.24	pCi/g	0.14	1
Protactinium-234	-0.125	U	0.01354	U	0.0242		0.269	pCi/g	0.35	1
Radium-226	0.272		0.4264		0.132	0.200	0.0567	pCi/g	0.54	1
Radium-228	0.216		0.3984		0.166		0.138	pCi/g	0.40	1
Thallium-208	0.190		0.1941		0.0644		0.0168	pCi/g	0.03	1
Thorium 228	0.387		0.4262		0.103		0.0450	pCi/g	0.19	1
Thorium-232	0.216		0.3984		0.166		0.138	pCi/g	0.40	1
Thorium-234	-1.01	U	0.9675		0.675		0.445	pCi/g	1.45	1
Uranium-235	-0.0242	U	-0.05142	U	0.101		0.249	pCi/g	0.06	1
Uranium-238	-1.01	U	0.9675		0.675		0.445	pCi/g	1.45	1

Lab Sample ID: MB 160-490812/1-A
Matrix: Solid
Analysis Batch: 492976

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490812

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium-227	0.1170	U	0.209	0.209		0.194	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Bismuth-212	-0.06471	U	0.528	0.528		0.361	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Bismuth-214	0.07479	U	0.0606	0.0610		0.0979	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Cesium-137	0.0000	U	0.0164	0.0164	0.0700	0.0234	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Lead-210	0.4321	U	0.975	0.976		0.768	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Lead-212	-0.004504	U	0.0744	0.0744		0.0628	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Lead-214	-0.1011	U	0.107	0.107		0.0783	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Potassium-40	0.3454	U	0.761	0.761		0.433	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Protactinium-231	0.0000	U	0.159	0.159		1.73	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Protactinium-234	0.02690	U	0.0241	0.0242		0.151	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Radium-226	0.07479	U	0.0606	0.0610	0.200	0.0979	pCi/g	12/03/20 13:12	12/24/20 07:50	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: MB 160-490812/1-A
Matrix: Solid
Analysis Batch: 492976

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490812

Analyte	MB MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Radium-228	0.05929	U	0.166	0.166		0.0924	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Thallium-208	-0.002713	U	0.0199	0.0200		0.0208	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Thorium 228	-0.004504	U	0.0744	0.0744		0.0628	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Thorium-232	0.05929	U	0.166	0.166		0.0924	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Thorium-234	0.09867	U	0.221	0.221		0.481	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Uranium-235	0.0000	U	0.0457	0.0457		0.277	pCi/g	12/03/20 13:12	12/24/20 07:50	1
Uranium-238	0.09867	U	0.221	0.221		0.481	pCi/g	12/03/20 13:12	12/24/20 07:50	1

Lab Sample ID: LCS 160-490812/2-A
Matrix: Solid
Analysis Batch: 492974

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490812

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium-241	96.4	98.61		10.3		0.442	pCi/g	102	87 - 116
Cesium-137	26.7	24.99		2.66	0.0700	0.0944	pCi/g	94	87 - 120
Cobalt-60	9.43	8.722		0.918		0.0493	pCi/g	92	87 - 115

Lab Sample ID: 160-40595-25 DU
Matrix: Solid
Analysis Batch: 492978

Client Sample ID: HPPG-SFU-TU107A-023
Prep Type: Total/NA
Prep Batch: 490812

Analyte	Sample Sample		DU DU		Total	LOQ	DLC	Unit	RER	RER
	Result	Qual	Result	Qual	Uncert. (2σ+/-)					Limit
Actinium 228	0.116	U	0.6529		0.177		0.0319	pCi/g	1.60	1
Actinium-227	-0.117	U	-0.3812	U	0.590		0.428	pCi/g	0.26	1
Bismuth-212	-0.377	U	0.3286	U	0.634		0.482	pCi/g	0.56	1
Bismuth-214	0.270		0.3790		0.159		0.0660	pCi/g	0.43	1
Cesium-137	0.0134	U	0.01409	U	0.0598	0.0700	0.0478	pCi/g	0.01	1
Lead-210	-0.213	U	-2.264	U	1.53		1.75	pCi/g	0.84	1
Lead-212	0.327		0.4177		0.102		0.0415	pCi/g	0.51	1
Lead-214	0.333		0.3870		0.144		0.0598	pCi/g	0.24	1
Potassium-40	7.92		9.505		1.83		0.282	pCi/g	0.51	1
Protactinium-231	0.000	U	0.0000	U	0.335		2.31	pCi/g	0	1
Protactinium-234	0.0983	U	-0.01530	U	0.0361		0.289	pCi/g	0.53	1
Radium-226	0.270		0.3790		0.159	0.200	0.0660	pCi/g	0.43	1
Radium-228	0.116	U	0.6529		0.177		0.0319	pCi/g	1.60	1
Thallium-208	0.140		0.1201		0.0585		0.0253	pCi/g	0.20	1
Thorium 228	0.327		0.4177		0.102		0.0415	pCi/g	0.51	1
Thorium-232	0.116	U	0.6529		0.177		0.0319	pCi/g	1.60	1
Thorium-234	0.697		0.1685	U	0.485		0.384	pCi/g	0.60	1
Uranium-235	0.147	U	0.1643	U	0.600		0.490	pCi/g	0.02	1
Uranium-238	0.697		0.1685	U	0.485		0.384	pCi/g	0.60	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS) (Continued)

Lab Sample ID: MB 160-490832/1-A
Matrix: Solid
Analysis Batch: 493377

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490832

Analyte	MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	-0.1405	U	0.389	0.389		0.204	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Actinium-227	0.1060	U	0.233	0.233		0.213	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Bismuth-212	-0.9069	U	1.30	1.31		1.31	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Bismuth-214	-0.1124	U	0.195	0.195		0.169	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Cesium-137	0.02373	U	0.106	0.106	0.0700	0.0844	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Lead-210	0.8434		1.17	1.17		0.768	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Lead-212	-0.001594	U	0.103	0.103		0.0849	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Lead-214	-0.1533	U	0.189	0.190		0.137	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Potassium-40	0.6779		0.685	0.689		0.372	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Protactinium-231	-0.8332	U	2.34	2.34		1.87	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Protactinium-234	0.05529	U	0.146	0.146		0.115	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Radium-226	-0.1124	U	0.195	0.195	0.200	0.169	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Radium-228	-0.1405	U	0.389	0.389		0.204	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thallium-208	0.005832	U	0.0140	0.0140		0.0330	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thorium 228	-0.001594	U	0.103	0.103		0.0849	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thorium-232	-0.1405	U	0.389	0.389		0.204	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Thorium-234	-0.8414	U	0.454	0.464		0.723	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Uranium-235	0.08293	U	0.251	0.251		0.219	pCi/g	12/03/20 14:31	12/30/20 06:31	1
Uranium-238	-0.8414	U	0.454	0.464		0.723	pCi/g	12/03/20 14:31	12/30/20 06:31	1

Lab Sample ID: LCS 160-490832/2-A
Matrix: Solid
Analysis Batch: 493376

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490832

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium-241	96.4	97.62		12.6		0.547	pCi/g	101	87 - 116
Cesium-137	26.7	29.90		3.56	0.0700	0.148	pCi/g	112	87 - 120
Cobalt-60	9.41	10.34		1.24		0.0533	pCi/g	110	87 - 115

QC Association Summary

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Rad

Leach Batch: 490609

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40595-1	HPPG-F-047	Total/NA	Solid	Dry and Grind	
160-40595-2	HPPG-F-048	Total/NA	Solid	Dry and Grind	
160-40595-3	HPPG-SFU-TU107A-001	Total/NA	Solid	Dry and Grind	
160-40595-4	HPPG-SFU-TU107A-002	Total/NA	Solid	Dry and Grind	
160-40595-5	HPPG-SFU-TU107A-003	Total/NA	Solid	Dry and Grind	
160-40595-6	HPPG-SFU-TU107A-004	Total/NA	Solid	Dry and Grind	
160-40595-1 DU	HPPG-F-047	Total/NA	Solid	Dry and Grind	
160-40595-4 DU	HPPG-SFU-TU107A-002	Total/NA	Solid	Dry and Grind	
160-40595-5 DU	HPPG-SFU-TU107A-003	Total/NA	Solid	Dry and Grind	

Leach Batch: 490616

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40595-7	HPPG-SFU-TU107A-005	Total/NA	Solid	Dry and Grind	
160-40595-8	HPPG-SFU-TU107A-006	Total/NA	Solid	Dry and Grind	
160-40595-9	HPPG-SFU-TU107A-007	Total/NA	Solid	Dry and Grind	
160-40595-10	HPPG-SFU-TU107A-008	Total/NA	Solid	Dry and Grind	
160-40595-11	HPPG-SFU-TU107A-009	Total/NA	Solid	Dry and Grind	
160-40595-12	HPPG-SFU-TU107A-010	Total/NA	Solid	Dry and Grind	
160-40595-13	HPPG-SFU-TU107A-011	Total/NA	Solid	Dry and Grind	
160-40595-14	HPPG-SFU-TU107A-012	Total/NA	Solid	Dry and Grind	
160-40595-15	HPPG-SFU-TU107A-013	Total/NA	Solid	Dry and Grind	
160-40595-16	HPPG-SFU-TU107A-014	Total/NA	Solid	Dry and Grind	
160-40595-17	HPPG-SFU-TU107A-015	Total/NA	Solid	Dry and Grind	
160-40595-18	HPPG-SFU-TU107A-016	Total/NA	Solid	Dry and Grind	
160-40595-19	HPPG-SFU-TU107A-017	Total/NA	Solid	Dry and Grind	
160-40595-20	HPPG-SFU-TU107A-018	Total/NA	Solid	Dry and Grind	
160-40595-21	HPPG-SFU-TU107A-019	Total/NA	Solid	Dry and Grind	
160-40595-22	HPPG-SFU-TU107A-020	Total/NA	Solid	Dry and Grind	
160-40595-23	HPPG-SFU-TU107A-021	Total/NA	Solid	Dry and Grind	
160-40595-24	HPPG-SFU-TU107A-022	Total/NA	Solid	Dry and Grind	
160-40595-25	HPPG-SFU-TU107A-023	Total/NA	Solid	Dry and Grind	
160-40595-26	HPPG-SFU-TU107A-024	Total/NA	Solid	Dry and Grind	
160-40595-27	HPPG-SFU-TU107A-025	Total/NA	Solid	Dry and Grind	
160-40595-25 DU	HPPG-SFU-TU107A-023	Total/NA	Solid	Dry and Grind	

Prep Batch: 490802

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40595-2	HPPG-F-048	Total/NA	Solid	Fill_Geo-21	490609
160-40595-3	HPPG-SFU-TU107A-001	Total/NA	Solid	Fill_Geo-21	490609
160-40595-4	HPPG-SFU-TU107A-002	Total/NA	Solid	Fill_Geo-21	490609
MB 160-490802/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490802/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40595-4 DU	HPPG-SFU-TU107A-002	Total/NA	Solid	Fill_Geo-21	490609

Prep Batch: 490806

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40595-1	HPPG-F-047	Total/NA	Solid	Fill_Geo-21	490609
160-40595-5	HPPG-SFU-TU107A-003	Total/NA	Solid	Fill_Geo-21	490609
MB 160-490806/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490806/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40595-5 DU	HPPG-SFU-TU107A-003	Total/NA	Solid	Fill_Geo-21	490609

QC Association Summary

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Rad

Prep Batch: 490812

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40595-6	HPPG-SFU-TU107A-004	Total/NA	Solid	Fill_Geo-21	490609
160-40595-7	HPPG-SFU-TU107A-005	Total/NA	Solid	Fill_Geo-21	490616
160-40595-8	HPPG-SFU-TU107A-006	Total/NA	Solid	Fill_Geo-21	490616
160-40595-9	HPPG-SFU-TU107A-007	Total/NA	Solid	Fill_Geo-21	490616
160-40595-10	HPPG-SFU-TU107A-008	Total/NA	Solid	Fill_Geo-21	490616
160-40595-11	HPPG-SFU-TU107A-009	Total/NA	Solid	Fill_Geo-21	490616
160-40595-12	HPPG-SFU-TU107A-010	Total/NA	Solid	Fill_Geo-21	490616
160-40595-13	HPPG-SFU-TU107A-011	Total/NA	Solid	Fill_Geo-21	490616
160-40595-14	HPPG-SFU-TU107A-012	Total/NA	Solid	Fill_Geo-21	490616
160-40595-15	HPPG-SFU-TU107A-013	Total/NA	Solid	Fill_Geo-21	490616
160-40595-16	HPPG-SFU-TU107A-014	Total/NA	Solid	Fill_Geo-21	490616
160-40595-17	HPPG-SFU-TU107A-015	Total/NA	Solid	Fill_Geo-21	490616
160-40595-18	HPPG-SFU-TU107A-016	Total/NA	Solid	Fill_Geo-21	490616
160-40595-19	HPPG-SFU-TU107A-017	Total/NA	Solid	Fill_Geo-21	490616
160-40595-20	HPPG-SFU-TU107A-018	Total/NA	Solid	Fill_Geo-21	490616
160-40595-21	HPPG-SFU-TU107A-019	Total/NA	Solid	Fill_Geo-21	490616
160-40595-22	HPPG-SFU-TU107A-020	Total/NA	Solid	Fill_Geo-21	490616
160-40595-23	HPPG-SFU-TU107A-021	Total/NA	Solid	Fill_Geo-21	490616
160-40595-24	HPPG-SFU-TU107A-022	Total/NA	Solid	Fill_Geo-21	490616
160-40595-25	HPPG-SFU-TU107A-023	Total/NA	Solid	Fill_Geo-21	490616
MB 160-490812/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490812/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	
160-40595-25 DU	HPPG-SFU-TU107A-023	Total/NA	Solid	Fill_Geo-21	490616

Prep Batch: 490832

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40595-26	HPPG-SFU-TU107A-024	Total/NA	Solid	Fill_Geo-21	490616
160-40595-27	HPPG-SFU-TU107A-025	Total/NA	Solid	Fill_Geo-21	490616
MB 160-490832/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490832/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 491323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40595-1	HPPG-F-047	Total/NA	Solid	DPS-7	490609
160-40595-3	HPPG-SFU-TU107A-001	Total/NA	Solid	DPS-7	490609
160-40595-13	HPPG-SFU-TU107A-011	Total/NA	Solid	DPS-7	490616
160-40595-23	HPPG-SFU-TU107A-021	Total/NA	Solid	DPS-7	490616
MB 160-491323/23-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-491323/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	

Prep Batch: 491944

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40595-1	HPPG-F-047	Total/NA	Solid	ExtChrom	490609
160-40595-3	HPPG-SFU-TU107A-001	Total/NA	Solid	ExtChrom	490609
160-40595-13	HPPG-SFU-TU107A-011	Total/NA	Solid	ExtChrom	490616
160-40595-23	HPPG-SFU-TU107A-021	Total/NA	Solid	ExtChrom	490616
MB 160-491944/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491944/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	
160-40595-1 DU	HPPG-F-047	Total/NA	Solid	ExtChrom	490609

Tracer/Carrier Summary

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40595-1
 SDG: GJ46599744

Method: 905 - Strontium-90 (GFPC)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)	
		Sr (40-110)	Y (40-110)
160-40595-1	HPPG-F-047	99.7	95.3
160-40595-3	HPPG-SFU-TU107A-001	98.5	95.7
160-40595-13	HPPG-SFU-TU107A-011	99.3	97.6
160-40595-23	HPPG-SFU-TU107A-021	98.5	96.1
LCS 160-491323/1-A	Lab Control Sample	100	99.8
MB 160-491323/23-A	Method Blank	100	92.7

Tracer/Carrier Legend

Sr = Sr Carrier

Y = Y Carrier

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

Lab Sample ID	Client Sample ID	Percent Yield (Acceptance Limits)
		Th-229 (30-110)
160-40595-1	HPPG-F-047	81.3
160-40595-1 DU	HPPG-F-047	86.1
160-40595-3	HPPG-SFU-TU107A-001	76.6
160-40595-13	HPPG-SFU-TU107A-011	91.6
160-40595-23	HPPG-SFU-TU107A-021	80.2
LCS 160-491944/2-A	Lab Control Sample	89.9
MB 160-491944/1-A	Method Blank	93.0

Tracer/Carrier Legend

Th-229 = Thorium-229



Environment Testing
America

ANALYTICAL REPORT

Eurofins TestAmerica, St. Louis
13715 Rider Trail North
Earth City, MO 63045
Tel: (314)298-8566

Laboratory Job ID: 160-40597-1
Laboratory Sample Delivery Group: D1189458
Client Project/Site: HPNS-Parcel G 501197
Revision: 2

For:
Aptim Federal Services LLC
4005 Port Chicago Hwy, Suite 200
Concord, California 94520

Attn: Rose Condit

Rhonda Ridenhower

Authorized for release by:
4/14/2021 2:54:19 PM

Rhonda Ridenhower, Client Service Manager
(314)298-8566
Rhonda.Ridenhower@Eurofinset.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Case Narrative

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40597-1
SDG: D1189458

Job ID: 160-40597-1

Laboratory: Eurofins TestAmerica, St. Louis

Narrative

CASE NARRATIVE

Client: Aptim Federal Services LLC

Project: HPNS-Parcel G 501197

Report Number: 160-40597-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

Eurofins TestAmerica, St. Louis attests to the validity of the laboratory data generated by Eurofins TestAmerica facilities reported herein. All analyses performed by Eurofins TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. Eurofins TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results for Chemistry analyses are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header. All soil/sediment sample results for radiochemistry analyses are based upon sample as dried and disaggregated with the exception of tritium, carbon-14, and iodine-129 by gamma spectroscopy unless requested as wet weight by the client."

Any minimum detectable concentration (MDC), critical value (DLC), or Safe Drinking Water Act detection limit (SDWA DL) is sample-specific unless otherwise stated elsewhere in this narrative.

Reference the chain of custody and condition upon receipt report for any variations on receipt conditions and temperature of samples on receipt.

Manual Integrations were performed only when necessary and are in compliance with the laboratory's standard operating procedure. Detailed information can be found in the raw data section of the level IV report.

The matrix for the Method Blank and LCS is as close to the following samples as can be reasonably achieved. Detailed information can be found in the most current revision of the associated SOP.

Radiochemistry sample results are reported with the count date/time applied as the Activity Reference Date.

This laboratory report is confidential and is intended for the sole use of Eurofins TestAmerica and its client.

Revision 1- Updated isotopic thorium to report DLC.

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40597-1
SDG: D1189458

Job ID: 160-40597-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Revision 2- Additional information requested in case narrative for total strontium

RECEIPT

The samples were received on 11/27/2020; the samples arrived in good condition, properly preserved. The temperature of the coolers at receipt was 16.1 C.

STRONTIUM-90 (GFPC)

Sample HPPG-SFU-TU107A-B-001 (160-40597-1) was analyzed for Strontium-90 (GFPC) in accordance with EPA 905. The samples were dried on 12/02/2020, prepared on 12/09/2020 and analyzed on 12/18/2020.

Strontium 90 Prep Batch 491323

When taking small mass aliquots from dried/disaggregated sample, the laboratory avoids large rocks/pebbles (as well as sticks, etc) which may constitute a larger than representative portion of the aliquot. Smaller rocks may be included. This is consistent with QSM and Laboratory SOP: HPPG-SFU-TU107A-B-001 (160-40597-1).

The method blank (MB) z-score is within limits and is stored in the level IV raw data. (MB 160-491323/23-A)

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

ISOTOPIC THORIUM (ALPHA SPECTROMETRY)

Sample HPPG-SFU-TU107A-B-001 (160-40597-1) was analyzed for Isotopic Thorium (Alpha Spectrometry) in accordance with DOE A01R_Th. The samples were dried on 12/02/2020, prepared on 12/15/2020 and analyzed on 12/30/2020.

Isotopic Thorium Prep Batch 491944

A blank population correction was applied to account for contributions to the analyte count rate from sources other than the sample itself. Interferences may include, but are not limited to, impurities in reagents, tracers, or glassware, or effects due to the measurement process (such as tailing or crosstalk). HPPG-SFU-TU107A-B-001 (160-40597-1), (LCS 160-491944/2-A), (MB 160-491944/1-A), (160-40595-A-1-D) and (160-40595-A-1-E DU)

Results for the method blank (MB) are negative more than 3 times the 1 total propagated uncertainty (TPU). This appears to be random in nature, and does not affect the sample results. The magnitude of the negative results is minimal compared to the client sample results. The laboratory does not believe this excursion adversely affects the data. (MB 160-491944/1-A).

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

RADIUM-226 BY GAMMA SPEC (21 DAY INGROWTH)

Sample HPPG-SFU-TU107A-B-001 (160-40597-1) was analyzed for Radium-226 by gamma spec (21 day ingrowth) in accordance with EPA GA_01_R. The samples were dried on 12/02/2020, prepared on 12/04/2020 and analyzed on 12/25/2020.

The method blank (MB) z-score associated with Prep Batch 160-490932 is within limits and is stored in the level IV raw data. (MB 160-490932/1-A)

Many isotopes requested for analysis do not have any gamma emissions, or the gamma emissions they do have are very poor. Often, such analytes are reported by gamma spectrometry assuming secular equilibrium with a longer-lived parent. The client should ensure that such inference is acceptable for their sample based upon process knowledge. The following assumptions were made for this report:

Inferred from	Reported to Analyte
Th-234	Pa-234
Th-234	U-238
Pb-210	Po-210
Pb-210	Bi-210
Cs-137	Ba-137m
Pb-212	Po-216
Xe-131m	Xe-131
Sb-125	Te-125m

Case Narrative

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

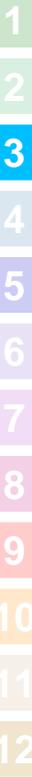
Job ID: 160-40597-1
SDG: D1189458

Job ID: 160-40597-1 (Continued)

Laboratory: Eurofins TestAmerica, St. Louis (Continued)

Ag-108m	Ag-108
Rh-106	Ru-106
Pb-212	Th-228
Pb-212	Ra-224
U-235	Th-231
Ac-228	Th-232
Ac-228	Ra-228
Th-227	Ra-223
Th-227	Ac-227
Th-227	Bi-211
Th-227	Pb-211
Bi-214	Ra-226

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.





APTIM Federal Services, LLC

4005 Port Chicago Hwy
Concord, CA 94520

Project Manager: Lisa Bercik
Phone #: (619)213-3389

Send Report to: Rose Condit
Phone/Fax Number: 415-987-0760
Address: 4005 Port Chicago Hwy

Sample Lead: Murri, Andrew

Sample Tech(s):

CHAIN OF CUSTODY

Ref. Document # 501197RSY-047

Project Number: 501197		Analysis Requested										Evidence Bag ID	Comment		
Project Name: Hunters Point Naval Shipyard: Parcel G Remedial Action		Gamma Spec (EPA 901.1 M) - Full 21 day in growth gamma	Strontium-90 (EPA 905 MOD)	Isotopic Th(228, 230, 232)	Dose Rate uR/Hr										
Project Location: San Francisco, CA															
Purchase Order #: 1159058															
Shipment/Pickup Date: 11/25/2020															
Waybill Number: 4957 0225 6056															
Lab Destination: Test America (St. Louis Lab) 13715 Rider Trail North Earth City, MO 63046															
Lab Contact Name/ph #: Rhoeda Ridenbower (314)298-8566															
Matrix	# of Containers	Preservatives (water)													
		Preservatives (soil)													
		Container Type													
Sample ID	Date	Time	Method	Matrix	# of Containers	Container Type									
HPPG-SFU-TU107A-B-001	11/25/2020	10:16	G	SO	1	16 oz. plastic jar	X		X		X		5	D1189458	

Special Instructions: 21 day in growth results only

Turanaround Time: 3-day 10-Day 28-day Other Level of QC Required: I II III Project Specific

Method Codes C = Composite G = Grab Matrix Codes: DW = Drinking Water; So = Soil; GW = Ground Water; SL = Sludge; WW = Waste Water; CP = Chip Samples; A = Air; ABS = Asbestos; PO = Pipe Opening

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Murri, Andrew		11/25/2020 11:59	Devin Lewis		11/25/2020 11:59
Devin Lewis		11/25/2020 11:59	SHIPPEDTOLAB		11/27/2020 09:12

*** Last 3 transfers shown above - Complete list of transfers on last page ***

MICHA KORRINHIZER



160-40597 Chain of Custody

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4/14/2021 (Rev. 2)



All Transfers for COC 501197RSY-047

Relinquished By:	Relinquisher Signature:	Relinquish Date Time:	Received By:	Received Signature:	Receive Date Time:
Murri, Andrew		11/25/2020 11:59	Devin Lewis		11/25/2020 11:59
Devin Lewis		11/25/2020 11:59	SHIPPEDTOLAB		11/27/2020 09:12

MICHA KORRINHIZER



Login Sample Receipt Checklist

Client: Aptim Federal Services LLC

Job Number: 160-40597-1

SDG Number: D1189458

Login Number: 40597**List Source: Eurofins TestAmerica, St. Louis****List Number: 1****Creator: Greer, Diane A**

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Definitions/Glossary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40597-1
SDG: D1189458

Qualifiers

Rad

Qualifier	Qualifier Description
U	Undetected at the Limit of Detection.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Method Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40597-1
SDG: D1189458

Method	Method Description	Protocol	Laboratory
905	Strontium-90 (GFPC)	EPA	TAL SL
A-01-R	Isotopic Thorium (Alpha Spectrometry)	DOE	TAL SL
GA-01-R	Radium-226 & Other Gamma Emitters (GS)	DOE	TAL SL
DPS-7	Preparation, Digestion/Precipitate Separation (7-Day In-Growth)	None	TAL SL
Dry and Grind	Preparation, Dry and Grind	None	TAL SL
ExtChrom	Preparation, Extraction Chromatography Resin Actinide Separation	None	TAL SL
Fill_Geo-21	Fill Geometry, 21-Day In-Growth	None	TAL SL

Protocol References:

- DOE = U.S. Department of Energy
- EPA = US Environmental Protection Agency
- None = None

Laboratory References:

TAL SL = Eurofins TestAmerica, St. Louis, 13715 Rider Trail North, Earth City, MO 63045, TEL (314)298-8566



Sample Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40597-1
SDG: D1189458

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
160-40597-1	HPPG-SFU-TU107A-B-001	Solid	11/25/20 10:16	11/27/20 09:12	

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

Client Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40597-1
 SDG: D1189458

Client Sample ID: HPPG-SFU-TU107A-B-001

Lab Sample ID: 160-40597-1

Date Collected: 11/25/20 10:16

Matrix: Solid

Date Received: 11/27/20 09:12

Method: 905 - Strontium-90 (GFPC)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Strontium-90	0.0249	U	0.185	0.185	0.331	0.151	pCi/g	12/09/20 18:42	12/18/20 20:15	1
Carrier	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Sr Carrier	93.5		40 - 110					12/09/20 18:42	12/18/20 20:15	1
Y Carrier	90.8		40 - 110					12/09/20 18:42	12/18/20 20:15	1

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Thorium-228	0.346		0.0675	0.0735	0.250	0.0271	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	0.254		0.0652	0.0686	0.250	0.0273	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	0.343		0.0566	0.0635	0.250	0.00838	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	%Yield	Qualifier	Limits					Prepared	Analyzed	Dil Fac
Thorium-229	78.4		30 - 110					12/15/20 14:37	12/30/20 10:45	1

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Analyte	Result	Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
Actinium 228	0.591		0.147	0.159		0.0289	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Actinium-227	0.160	U	0.380	0.381		0.345	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Bismuth-212	1.35		0.500	0.519		0.147	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Bismuth-214	0.452		0.113	0.122		0.0258	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Cesium-137	-0.0169	U	0.0641	0.0642	0.0700	0.0514	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Lead-210	-0.695	U	1.61	1.62		1.35	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Lead-212	0.417		0.0869	0.102		0.0387	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Lead-214	0.507		0.0991	0.112		0.0371	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Potassium-40	8.46		1.34	1.60		0.313	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Protactinium-231	-0.842	U	2.98	2.98		2.43	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Protactinium-234	-0.0973	U	0.238	0.238		0.192	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Radium-226	0.452		0.113	0.122	0.200	0.0258	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Radium-228	0.591		0.147	0.159		0.0289	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Thallium-208	0.106		0.0944	0.0951		0.0446	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Thorium 228	0.417		0.0869	0.102		0.0387	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Thorium-232	0.591		0.147	0.159		0.0289	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Thorium-234	-0.713	U	0.934	0.938		0.795	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Uranium-235	0.0992	U	0.220	0.220		0.224	pCi/g	12/04/20 14:01	12/25/20 10:26	1
Uranium-238	-0.713	U	0.934	0.938		0.795	pCi/g	12/04/20 14:01	12/25/20 10:26	1

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40597-1
 SDG: D1189458

Method: 905 - Strontium-90 (GFPC)

Lab Sample ID: MB 160-491323/23-A
Matrix: Solid
Analysis Batch: 492430

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491323

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Strontium-90	0.07392	U	0.140	0.140	0.331	0.108	pCi/g	12/09/20 18:42	12/18/20 20:20	1
Carrier	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Sr Carrier	100		40 - 110		12/09/20 18:42	12/18/20 20:20	1			
Y Carrier	92.7		40 - 110		12/09/20 18:42	12/18/20 20:20	1			

Lab Sample ID: LCS 160-491323/1-A
Matrix: Solid
Analysis Batch: 492430

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491323

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Strontium-90	7.76	5.897		0.638	0.331	0.109	pCi/g	76	75 - 125
Carrier	LCS %Yield	LCS Qualifier	Limits						
Sr Carrier	100		40 - 110						
Y Carrier	99.8		40 - 110						

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Lab Sample ID: MB 160-491944/1-A
Matrix: Solid
Analysis Batch: 493574

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 491944

Analyte	MB	MB	Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Thorium-228	-0.03528	U	0.0205	0.0207	0.250	0.0163	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-230	-0.06446	U	0.0317	0.0321	0.250	0.0228	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Thorium-232	-0.003259	U	0.00917	0.00917	0.250	0.00754	pCi/g	12/15/20 14:37	12/30/20 10:45	1
Tracer	MB %Yield	MB Qualifier	Limits		Prepared	Analyzed	Dil Fac			
Thorium-229	93.0		30 - 110		12/15/20 14:37	12/30/20 10:45	1			

Lab Sample ID: LCS 160-491944/2-A
Matrix: Solid
Analysis Batch: 493575

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 491944

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec. Limits
				Uncert. (2σ+/-)					
Thorium-230	2.01	1.989		0.213	0.250	0.0233	pCi/g	99	81 - 118
Tracer	LCS %Yield	LCS Qualifier	Limits						
Thorium-229	89.9		30 - 110						

QC Sample Results

Client: Aptim Federal Services LLC
 Project/Site: HPNS-Parcel G 501197

Job ID: 160-40597-1
 SDG: D1189458

Method: GA-01-R - Radium-226 & Other Gamma Emitters (GS)

Lab Sample ID: MB 160-490932/1-A
Matrix: Solid
Analysis Batch: 493019

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 490932

Analyte	MB		Count	Total	LOQ	DLC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier	Uncert. (2σ+/-)	Uncert. (2σ+/-)						
Actinium 228	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Actinium-227	0.2114	U	0.369	0.370		0.252	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-212	-0.5716	U	0.701	0.704		0.748	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Bismuth-214	0.1200		0.0849	0.0858		0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Cesium-137	0.01945	U	0.0528	0.0528	0.0700	0.0284	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-210	-1.091	U	1.58	1.59		1.35	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-212	0.05856		0.0656	0.0660		0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Lead-214	-0.004878	U	0.0790	0.0790		0.0648	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Potassium-40	-0.3926	U	1.05	1.05		0.608	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-231	-0.7658	U	2.88	2.88		2.34	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Protactinium-234	0.1086		0.163	0.164		0.0693	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-226	0.1200		0.0849	0.0858	0.200	0.0937	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Radium-228	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thallium-208	0.006909	U	0.0135	0.0135		0.0442	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium 228	0.05856		0.0656	0.0660		0.0417	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-232	0.1066	U	0.0739	0.0747		0.116	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Thorium-234	-0.7448	U	0.597	0.603		0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-235	0.07022	U	0.183	0.183		0.144	pCi/g	12/04/20 14:01	12/25/20 08:14	1
Uranium-238	-0.7448	U	0.597	0.603		0.681	pCi/g	12/04/20 14:01	12/25/20 08:14	1

Lab Sample ID: LCS 160-490932/2-A
Matrix: Solid
Analysis Batch: 493020

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 490932

Analyte	Spike Added	LCS Result	LCS Qual	Total	LOQ	DLC	Unit	%Rec	%Rec.
				Uncert. (2σ+/-)					Limits
Americium-241	96.4	96.82		10.2		0.624	pCi/g	100	87 - 116
Cesium-137	26.7	26.82		2.90	0.0700	0.119	pCi/g	100	87 - 120
Cobalt-60	9.43	9.590		1.04		0.0186	pCi/g	102	87 - 115

QC Association Summary

Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40597-1
SDG: D1189458

Rad

Leach Batch: 490770

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40597-1	HPPG-SFU-TU107A-B-001	Total/NA	Solid	Dry and Grind	

Prep Batch: 490932

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40597-1	HPPG-SFU-TU107A-B-001	Total/NA	Solid	Fill_Geo-21	490770
MB 160-490932/1-A	Method Blank	Total/NA	Solid	Fill_Geo-21	
LCS 160-490932/2-A	Lab Control Sample	Total/NA	Solid	Fill_Geo-21	

Prep Batch: 491323

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40597-1	HPPG-SFU-TU107A-B-001	Total/NA	Solid	DPS-7	490770
MB 160-491323/23-A	Method Blank	Total/NA	Solid	DPS-7	
LCS 160-491323/1-A	Lab Control Sample	Total/NA	Solid	DPS-7	

Prep Batch: 491944

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
160-40597-1	HPPG-SFU-TU107A-B-001	Total/NA	Solid	ExtChrom	490770
MB 160-491944/1-A	Method Blank	Total/NA	Solid	ExtChrom	
LCS 160-491944/2-A	Lab Control Sample	Total/NA	Solid	ExtChrom	

Tracer/Carrier Summary

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Client: Aptim Federal Services LLC
Project/Site: HPNS-Parcel G 501197

Job ID: 160-40597-1
SDG: D1189458

Method: 905 - Strontium-90 (GFPC)

Matrix: Solid

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Sr (40-110)	Y (40-110)
160-40597-1	HPPG-SFU-TU107A-B-001	93.5	90.8
LCS 160-491323/1-A	Lab Control Sample	100	99.8
MB 160-491323/23-A	Method Blank	100	92.7

Tracer/Carrier Legend
Sr = Sr Carrier
Y = Y Carrier

Method: A-01-R - Isotopic Thorium (Alpha Spectrometry)

Matrix: Solid

Prep Type: Total/NA

		Percent Yield (Acceptance Limits)
Lab Sample ID	Client Sample ID	Th-229 (30-110)
160-40597-1	HPPG-SFU-TU107A-B-001	78.4
LCS 160-491944/2-A	Lab Control Sample	89.9
MB 160-491944/1-A	Method Blank	93.0

Tracer/Carrier Legend
Th-229 = Thorium-229